Reading the specification sheet allows you to be vigilant

Reading a specification sheet of a plant extract logically provides a lot of information, but sometimes you have to know how to interpret it. In order to be able to effectively compare different origins of the same plant extract, it is necessary to pay close attention to certain points of vigilance. The implementation in France of Annex II together with the plant decree of June 2014 has enabled a first step in the description of plant extracts, allowing actors to better compare different sources, and to be able to select the best source according to their needs and targeted activities, and in a constant search for quality, better efficiency and safer products.

Clear description of the plant

Latin name

The only internationally recognized name. It is composed at least of a genus and species name and an author's name or initials. It can be completed by a variety name. Ex. *Rhodiola rosea* L.

> The same plant can have several Latin names:
> Coleus forskohlii = Plectranthus forskohlii

Common name / vernacular name

This is the name commonly used for a plant in a given country or region. The **same common name may correspond to several different plants**, hence the need to cross-check with the Latin name if only the vernacular name is given.

> Ginseng can be used for Panax ginseng, Siberian ginseng (Eleutherococcus), Indian ginseng (Ashwagandha), Peruvian ginseng (Maca), American ginseng, Brazilian ginseng, Himalayan ginseng, ... with very different properties.
>
> The name Curcuma is used for *Curcuma longa* L., but also for *Curcuma xanthorrhiza*.

It might also be a case of the supplier wanting to play on the name for commercial purposes:

> use of *Rhodiola crenulata* for 'Rhodiola' *Rhodiola rosea*. The ratio between total rosavins (rosavin+rosarin+rosin only) and salidroside is in the order of 2.5:1 to 3:1 for *Rhodiola rosea*, not for *R. crenulata* (more salidroside found by analysis).

The same plant (same Latin name) can have several common names

> Centella = Gotu kola = Hydrocotyle =
> *Centella asiatica*

Plant part

The active ingredient profile varies according to the part of the plant used, and some parts may be forbidden (e.g. borage leaf) or even toxic, or may not allow a claim at all. Another plant part may also be used discreetly to reduce the cost of the extract (e.g. ginseng leaf, ashwagandha root). Precise analysis of the active ingredient profile and ratio, or TLC, provides more information on the actual parts used.

Origin of the plant

Knowing the origin of the plant helps to avoid certain risks:

- risk of shortage due to tense political situations,
- risk of contaminants due to the local use of prohibited phytosanitary products, for example,
- The active ingredient profile (the same plant may have different active ingredient profiles depending on the origin, even if close -

> The monomer/dimer ratio is practically reversed between Chardonnay seeds from Champagne and Burgundy

- local restrictions on resources (e.g. a plant indicated as being of a geographical origin when it is in fact hardly available in that region), etc...

Other parameters

The visual appearance, taste and smell of a plant are also criteria for a quick and pragmatic first check.

> a fucoxanthin extract is coloured
> harpagophytum is very bitter
> valerian has a characteristic smell

Other identification methods exist of course, such as TLC, HPLC, UPLC fingerprint, DNA analysis, GCMS - to be adapted according to the plants.

You may also refer to monograph (EMA, WHO, ...), pharmacopoeia (EP...), wfoplantlist.org, theplantlist.org, Health Canada, etc...

The plant extract ratio

For the **same plant** (or part of a plant), the **same solvent** leads to the **same extraction ratio**. This means that a client cannot ask for the ratio he wants to match a claim, unless it is a dilution.

The ratio given must be understandable, and the final ratio (DER, Drug Extract Ratio) must be mentioned.

DER (Drug Extract Ratio)

ratio between the quantity of the initial dry plant and the final extract, including the carrier. This ratio can vary depending on the standardization, and will be lower than the PER.

PER (Plant Extract Ratio)

ratio between the initial quantity of dry plant and the extract (whether it is a simple extraction, a purification, etc.), therefore before standardisation with a carrier or any element external to the plant (additives, drying aid, etc.).

NER (Native Extract Ratio)

ratio between the quantity of the initial dry plant and the extract obtained by a simple extraction (i.e. without purification for example), and before any external contribution. It does not change, or changes only slightly, for the same part of the plant and the same solvent (see the "What is an extract" pages).

> Eleutherococcus 8-10:1 (NER) with ethanol 30% provides 1-1.2% eleutherosides. It is not restandardized, so NER = PER = DER = 8-10:1. In addition to 1% eleutherosides, the extract provides 99% of the plant's totum.
>
> A stronger solvent + purification (more 'efficient' extraction) provides up to 10% eleutherosides for 60-70:1 (=PER). Standardized to 1% by dilution of 10% extract and 90% carrier: its DER is therefore logically 6-7:1. The extract still provides 1% eleutherosides but only 9% other plant compounds and 90% carrier

By comparing different specification sheets, it is easy to find the inconsistencies and the correct information.

> A 10:1 extract of harpagophytum cannot provide only 2% harpagoside, and the NER is rather 2-3:1.

Similarly, the literature can provide information on the active ingredients of a plant.

> Bacopa contains about 1.5 to 2.5% bacosides (by HPLC). Due to losses during extraction, a 20% extract corresponds to 15:1, or even 10-12:1 for the best plants

It is so recommended to check the percentage of native extract and of carrier/additives, as well as the typical markers of the plant.

Ratios and prices

The ratio must correspond with the cost price of the raw material according to its active content (several markers allowing a greater precision).

> Guarana provides 3-5% caffeine, for a cost of $6. 12% endogenous caffeine extract (i.e. from guarana) corresponds to a ratio of 3-4:1, so a raw material cost of at least 20€, without any production or commercial charge yet.

The solvents

The specification sheet mentions all the solvents used, in extraction and potentially in purification. If not indicated in the sheet, the ratio of solvents is given in Annex II. The solvent must comply with local regulations - including residuals - and be sufficiently selective where necessary. Not all solvents are miscible with each other.

> Ethanol 25 corresponds to 25% ethanol in 75% water
> Ethyl acetate is not water-soluble, and often used for purification
> Main solvents for solid:liquid extraction are water, ethanol (extraction, column chromatography), Ethyl acetate, CO_2.

The solvent is adapted to the plant and to the types of molecules to be extracted (in particular their polarity). You can check whether the declared solvent allows the desired compounds to be extracted.

> *Boswellia serrata* (resin) cannot be extracted with water, even hot water

Certain solvents such as supercritical CO_2 (apolar, therefore rather for apolar molecules such as oils) do not leave residues in the extract. But it can happen that a solvent is used although not mentioned in the specification sheet, for reasons for example of cleaning the plant but also cleaning of certain contaminants, or of another solvent.

You can ask for the process flow chart - when available - for more information on the different extraction steps, the solvents, but also the control points.

The markers

Actives and markers are parameters that confirm the extract and its properties. An extract does not provide just one active ingredient, but a whole profile of compounds.

Many analytical methods exist: UV, HPLC, Gravimetry, TLC, etc.... It is important to understand that a method only allows us to know how the extract reacted to that method. For example, the UV method must be associated with a suitable wavelength. The HPLC method must use a known standard, etc.

> A blueberry extract yields 36% anthocyanin by HPLC as Cyanidin, but in fact only 28% anthocyanin by HPLC as Cyanidin-3-O-G (which is one of the anthocyanins present in the extract)

A method can also analyze a family of products, even if the specification sheet indicates one molecule

> A centella extract indicated as 20% asiaticosides by UV may actually corresponds to the total saponins. The same extract can give 5-6% asiaticosides by HPLC, as asiaticoside.

The full and detailed HPLC profile is also a good indicator where possible as it allows for the reading of multiple actives or markers. And it also allows to check if one peak stands out exceptionally more than the others. This is the case for instance to describe *Gingko biloba*.

> A 36% antocyanin bilberry extract shows 18 specific peaks, while a 36% antocyanin blackcurrant extract shows 4 main peaks.

The words in the method also gives information about what has been analyzed, and on what basis.

> Harpagophytum 10% harpagosides UV (in fact glucoiridoids), meets 5-6% Harpagosides by HPLC (in fact glucoiridoids as harpagoside), and 3% Harpagoside by HPLC (without 's', so only the active)

You can also check the coherence of the conversion factors sometimes mentioned in the sheet.

> A broccoli extract with 5% glucoraphanin by HPLC cannot provide 4% sulforaphane by conversion, if only by Lavoisier's law (see Sulfodyne page).

The analysis can also be carried out in search of markers typical of another plant.

> Zederone (a sesquiterpene) is used to differentiate the species *Curcuma longa* from *Curcuma elaeta*

Do not hesitate to ask us how we integrate the specific information of each plant extract. That's one of our strenght.