NUTRINDX WHITE PAPER

Extraction methods compared

How a botanical is extracted shapes its purity, potency and footprint. A NutrIndx technical note.

Why extraction defines quality

The same plant can yield very different products depending on how its active compounds are pulled out. Extraction method affects which compounds are captured, how pure the result is, and what residues remain.

Supercritical CO_2

Above its critical point (about 31°C and 74 bar) carbon dioxide becomes a supercritical fluid with tunable solvent power. It is non-toxic and recognized as safe (GRAS), and because it returns to a gas at ambient pressure it leaves essentially no solvent residue. It is used industrially for coffee decaffeination, hops, omega-3 concentration and botanical (including CBD) extraction.

Solvent extraction

Ethanol (food-safe) and hexane (a petroleum solvent) are cheaper and effective; reputable manufacturers then strip the solvent and test the finished product against residual-solvent limits set by USP <467> and ICH Q3C.

Ionic liquids and solvent recovery

Ionic liquids — salts that are liquid near room temperature — are tunable, barely-evaporating designer solvents used in research to extract delicate compounds. At scale, recovering and reusing the solvent lowers both cost and environmental impact — a core green-chemistry principle.

Heat, cold and standardization

Heat speeds extraction but can degrade fragile compounds, so cold or supercritical methods protect heat-sensitive aromas and vitamins. A quality extract is also standardized to a defined percentage of its active so each dose is consistent.

References

1 Brunner G. Supercritical fluids as solvents and reaction media (overview). Annu Rev Chem Biomol Eng, 2010.

2 United States Pharmacopeia. General Chapter <467> Residual Solvents; ICH Q3C(R) guideline.

3 US FDA. GRAS status of carbon dioxide; 21 CFR 184.1240.