

Echinacea: an extraordinary phytochemical complexity and a wide variety of products

The commercially available extracts from Echinacea differ in:

- > **Medicinal species** (*E. purpurea*, *E. angustifolia*, *E. pallida*)
- > **Part of the plant** (roots, aerial parts)
- > **Storage conditions and transformative process**

These variables strongly influence the nature and the content of phytochemical substances present in the final product: the Echinacea phytochemical pattern is variable depending on the species and the drug considered (see Table 1), while storage conditions, drying and extractive methods may affect the integrity of the original phytocomplex.[1-5]

The extracts usually present on the market are from dried plants, obtained from one or two species of Echinacea with echinacoside or polysaccharides assay, even if nowadays a great importance is given to the alkylamide fraction and more generally to the entire phytocomplex for therapeutical purposes.[6-7]

Tabella 1. Quali-quantitative variation of phytochemical compounds in relation to the species and the drug of Echinacea.[8-17]

| | <i>E. PURPUREA</i> | <i>E. ANGUSTIFOLIA</i> | <i>E. PALLIDA</i> |
|---|----------------------------------|----------------------------------|----------------------------------|
| POLYSACCHARIDES (POLAR FRACTION) | | | |
| HETEROXYLANS (PS-I) AND ARABINORHAMNOGALACTANS (PS-II) | ++++ (aerial parts) | absent | absent |
| CAFFEIC ACID DERIVATES (MEDIUM POLARITY FRACTION) | | | |
| ECHINACOSIDE | absent | ++++ (aerial parts and roots) | ++++ (aerial parts and roots) |
| CICHORIC ACID | ++++ (aerial parts and roots) | traces | ++++ (aerial parts) |
| CINARIN | absent | ++++ (roots) | absent |
| LIPOPHILIC COMPOUNDS (APOLAR FRACTION) | | | |
| ALKYLAMIDES (Echinacein and isomers dodeca-2,4,8,10-tetraenoic acid isobutylamide) | ++++ (aerial parts and roots) | ++++ (aerial parts and roots) | ++++ (aerial parts) |
| POLYINES | absent | absent | ++++ (roots) |

Ekina3

THE COMBINED ACTION OF THE THREE SPECIES OF ECHINACEA RESPECTING THE ORIGINAL PHYTOCOMPLEX FOR A TOTAL IMMUNOMODULANT AND ANTIMICROBIAL ACTION

E. PALLIDA



E. ANGUSTIFOLIA



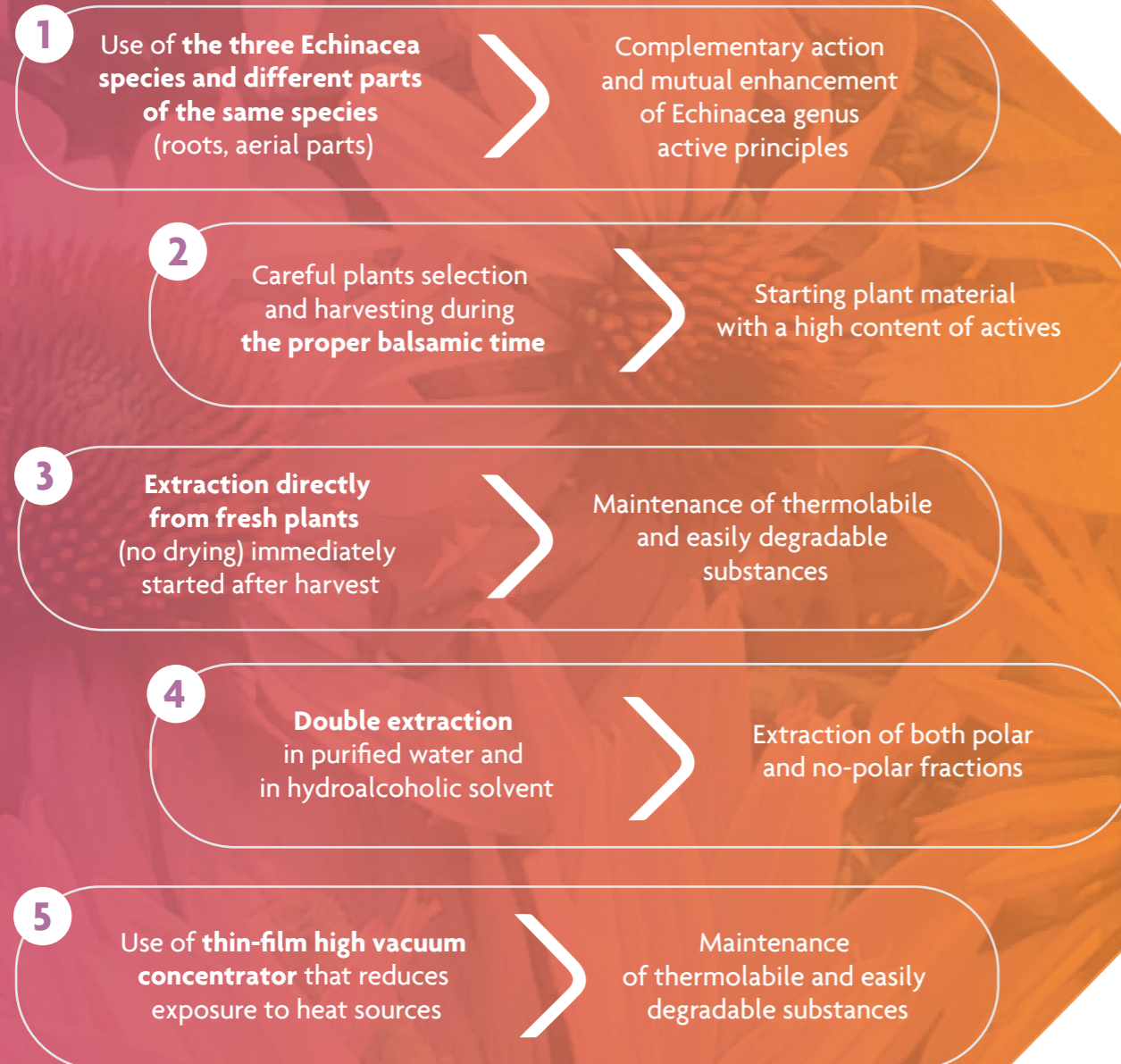
E. PURPUREA



Properly designed and developed to provide high efficacy and quality

Ekina3 is a dried extract made up of a calibrated mix of the three Echinacea medical species

(*E. purpurea*, *E. angustifolia*, *E. pallida*) and it's obtained directly from fresh plants. The Echinacea plants are grown and processed in Italy.



1> The three Echinacea mix: synergistic action of all active ingredients

Ekina3 is made up of the three Echinacea species using roots and/or aerial parts granting the synergistic action of all actives:



IMMUNOMODULANT ACTIVITY [12,18-24]

ALKYLAMIDES, CICHORIC ACID, POLYSACCHARIDES

- > Phagocytosis activation by neutrophils and macrophages (alkylamides, cichoric acid, heteroxylyan PS-I)
- > Cytotoxic activity stimulation of macrophages with release of TNF- α , IL-1 and IL-6 (arabinorhamnogalactan PS-II)
- > Natural Killer cell activity stimulation due to reduced production of prostaglandins and leukotrienes (alkylamides)

ANTIMICROBICAL ACTIVITY [12,25-28]

ECHINACOSIDE, CICHORIC ACID, POLYSACCHARIDES, POLYINES

- > Viral receptors inhibition on the cell surface (echinacoside)
- > Direct inhibition of tissue and bacterial hyaluronidase and indirect inhibition of the hyaluronic acid- hyaluronidase system due to increased fibroblasts activity (cichoric acid, polysaccharides)
- > Bacteriostatic activity (polyine)

ANTI-INFLAMMATORY ACTIVITY [29-32]

ALKYLAMIDES

- > Cyclooxygenase and lipoxygenase enzymes inhibition and consequent reduction in the prostaglandins and leukotrienes production
- > Stimulation of adrenocortical hormones secretion with cortisone-like effect
- > Interaction with CB2 cannabinoids receptors

2) Cultivation and harvesting: high content of actives in the starting plants

Echinacea plants are cultivated without the use of synthetic pesticides and fertilizers in agricultural grounds located far away from busy industrial roads.

Roots and aerial parts are collected in the **optimal balsamic time**, when the phytocomplex production is maximum:

- roots > autumn-winter, period of quiescence with the accumulation of secondary metabolites;
- aerial parts > June-July, corresponding to the period of flowering.

3) From the harvesting to the finish product: maximum integrity of the phytocomplex

4)

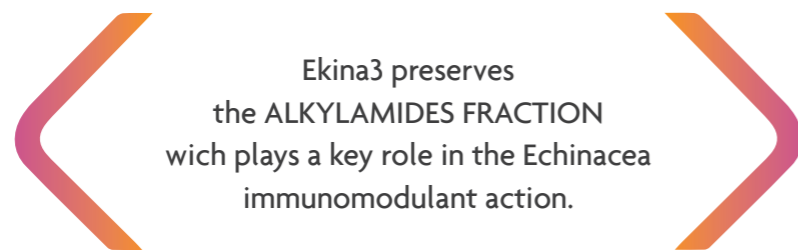
The extraction immediately begins after the harvest.

5)

The use of fresh vegetable matrix guarantees the presence of caffeic acid derivatives and alkylamides, molecules which are sensitive to the oxidation processes occurring during drying.[1,3-5]

The double extraction, first in purified water and then in hydroalcoholic solvent, **allows the extraction of actives with different polarity**: polysaccharides need water, while caffeic acid derivatives and alkylamides require alcohol.

The concentration of the solution is made by a **thin-film high vacuum concentrator** that reduces exposure to heat sources enabling to **preserve thermolabile and easily degradable substances**. The last production stage is the spray-drying. The dried extract* is solvent free and has a drug/extract ratio (D/E) of 4:1.



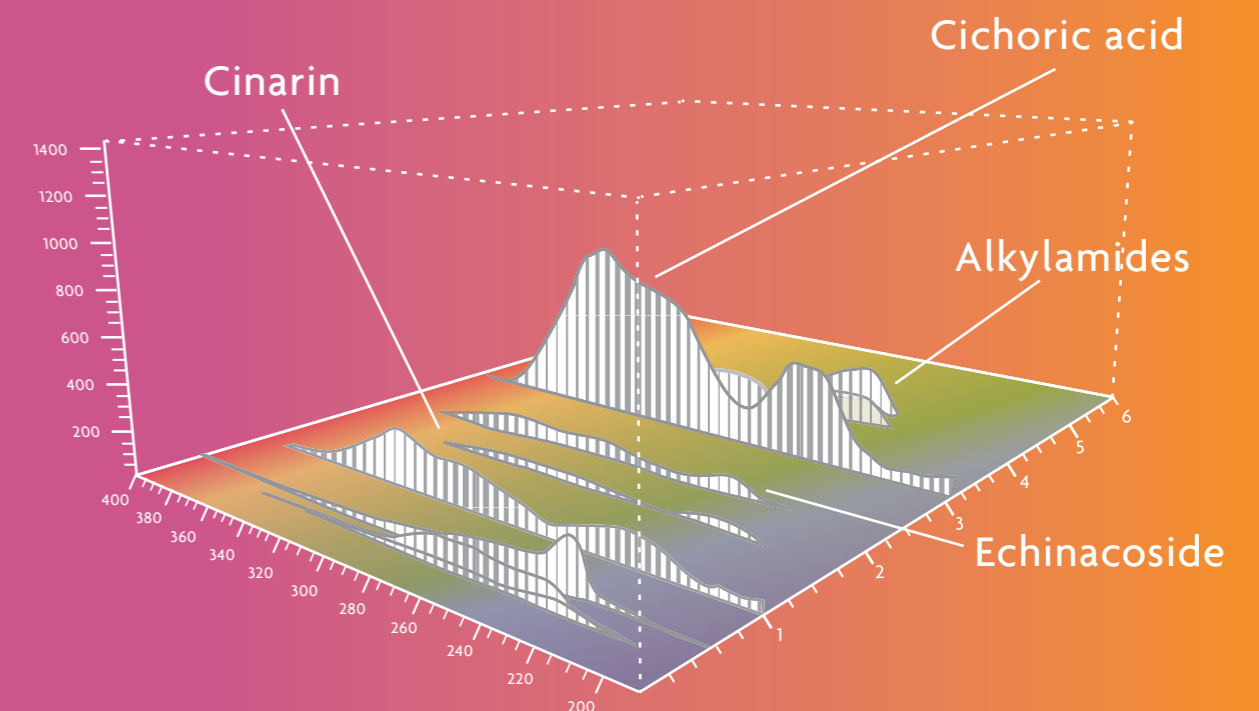
*Ekina3 is also available as concentrated aqueous extract (in this case the extractive solution, without the alcohol component, is concentrated to obtain a D/E ratio of 1:2)

Multiple markers HPLC assay: guaranteed presence of all Echinacea active ingredients

The analysis method has been developed by Padua University Department of Pharmaceutical Sciences.

Table 2. **Phytoconstituents content** for 100 g of Ekina3 dried extract standard sample:

| CHEMICAL COMPOUND | ASSAY | METHOD |
|---------------------------|---------|----------|
| ECHINACOSIDE | ≥ 0,2% | HPLC-DAD |
| CINARIN | ≥ 0,1% | HPLC-DAD |
| CICHORIC ACID | ≥ 0,3% | HPLC-DAD |
| TOTAL CAFFEIC DERIVATIVES | ≥ 2,3% | HPLC-DAD |
| DODECA ISOBUTYLAMIDE | ≥ 0,2% | HPLC-DAD |
| POLYSACCHARIDES | ≥ 14,9% | HPLC-DAD |



Ekina3

Ekina3 it's part of the line
Ek³ Italian fresh plants by EKAP

Distributed by:



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Ekina3

Three Echinacea species for the maximum efficacy

Vegetable extracts from fresh plants
Made in Italy