



**Holistic approaches for
optimizing ingredient efficacy & bioavailability**



- Aurea Biolabs opened US operations in September 2019 to bring Plant Lipid's nutraceutical offerings and its patented ingredient innovations direct to the market.
- Focused on product development, extraction, isolation and formulation of bio-active ingredients from spices and other natural extracts.
- Part of Plant Lipids, Aurea has sustainable and traceable raw material sourcing with a long history of partnership driven relationships with farmers.
- Drives value to our customer base by leveraging our position as a global leader in turmeric production and other herbal ingredients.

OPERATIONS

40

YEARS

MANUFACTURING
HUBS

06

CLIENTS ACROSS

85

COUNTRIES

1540

EMPLOYEES

30000

ACRES UNDER
CONTRACT
FARMING

PROCESSING
CAPACITY

350

MT DAILY

02

R&D CENTRES

SPICES & HERBS
IMPORTED FROM

29

COUNTRIES

OFFICES IN

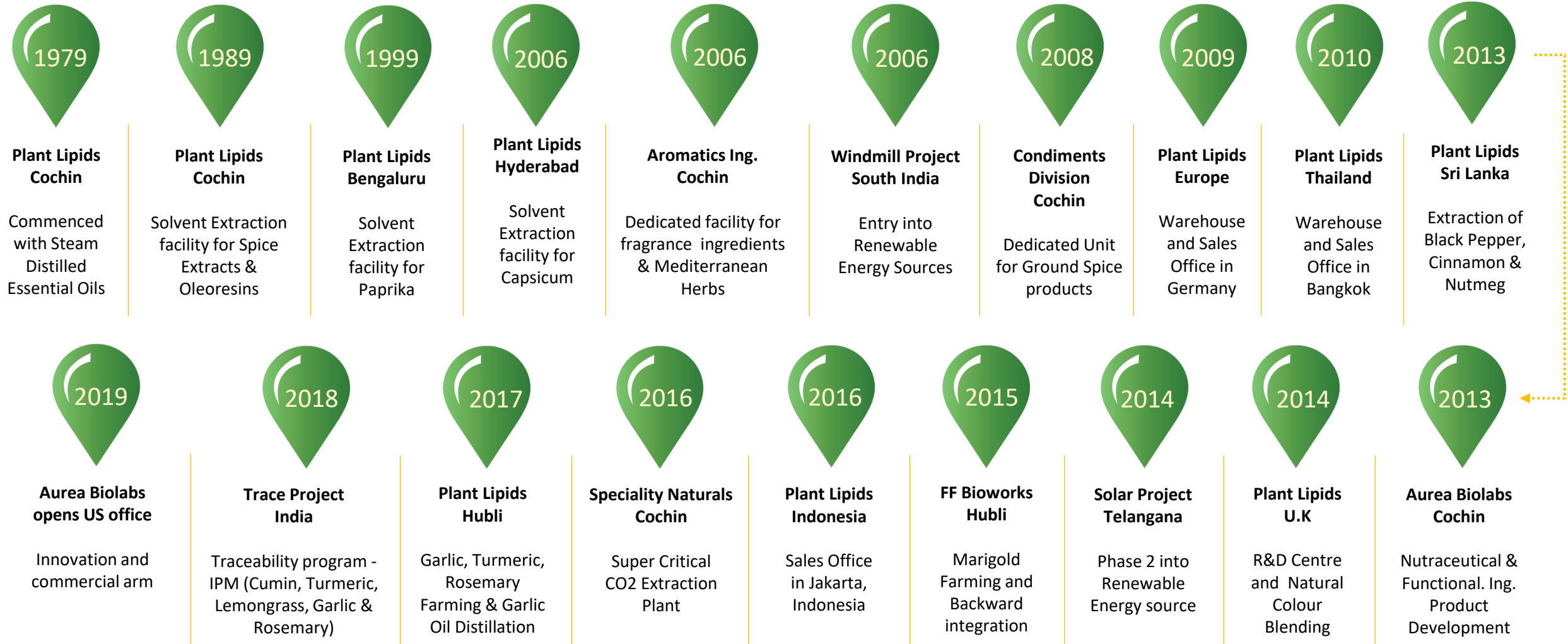
06

COUNTRIES

05

APPLICATION
FOCUSSED
VERTICALS

Milestones





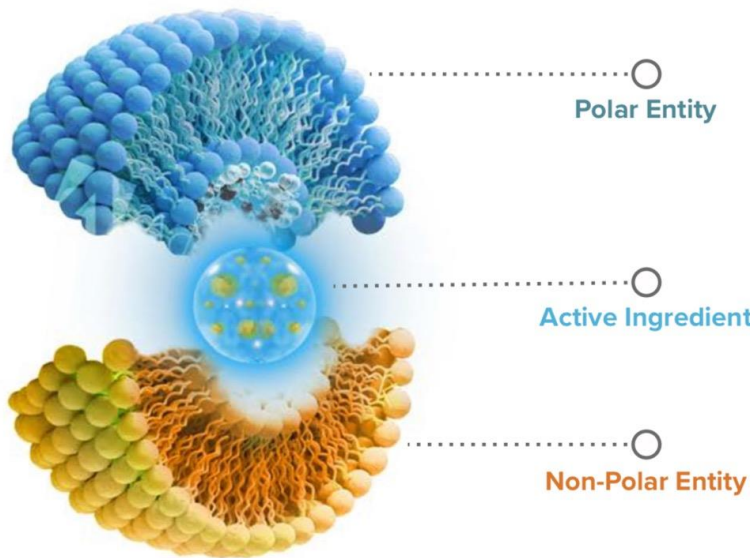
- Established in **2013** to drive innovation leveraging its parent company's decades of expertise in extraction.
- September **2019**: Established North American operations to bring its innovations and extracts direct to market.
- January **2020**: A new manufacturing facility and state of the art lab joined the Plant Lipids HQ campus to meet the growing current and future demand of its ingredients.



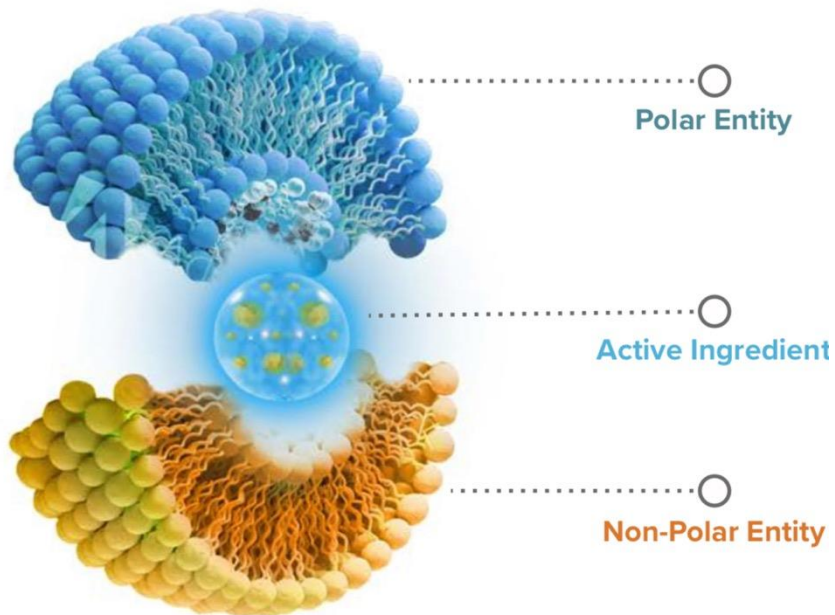
Bringing Ayurveda in to the 21st century



- Many natural bio-active molecules like Curcumin are poorly absorbed and get metabolized very easily.
- These molecules are mid polar in nature (not hydrophilic or hydrophobic), which means not completely water soluble/oil soluble.
- Hydrophilic (water soluble) molecules dissolve easily in the gastrointestinal tract but are poorly absorbed, whereas hydrophobic (water insoluble) molecules do not dissolve easily but are more readily absorbed with increase in solubility.
- We addressed this issue with complexing the active molecules with polar and nonpolar molecules to enhance the solubility, bioavailability, and efficacy.



- Polar Non-polar Sandwiching (PNS) technology facilitates the interaction of active molecules with the hydrophobic and hydrophilic groups, and encapsulates biomolecules in polar and non-polar entities to improve its solubility and stability in aqueous systems.
- The unique technology involves sandwiching of Polar & Non Polar entities of any natural spice/herb to recreate a complete natural matrix.
- This results in the active molecule being well protected inside the natural matrix so that the tendency of any natural molecule for conjugation is controlled by ensuring enhanced efficacy of the product.
- The recreation of natural matrix helps to deliver ingredient with assured biological activity. PNS Technology can be extended to any spice or herb delivering the bio-active ingredient at the site for ensured biological activity by the protection of active molecules by polar-non-polar interactions.



Polar Entities – Plant Water Extracts

Fibers
Carbohydrates
Proteins

Active Ingredients (CORE – Mid Polar)

Standardized Extract

Non Polar Entities - Oil Extracts

Volatile oils



Delivery format versatility



*Tablets, capsules
softgels*



Powders

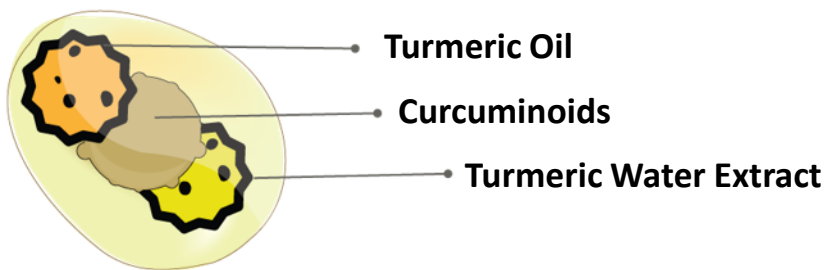


Beverage

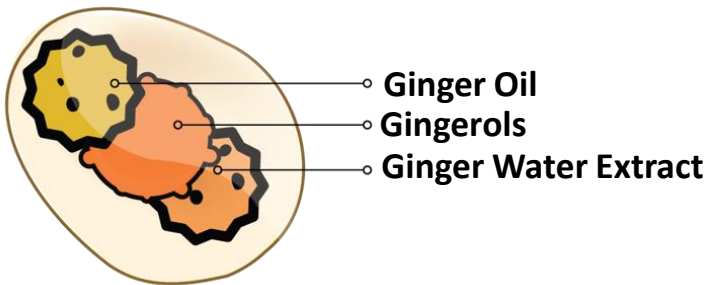


Functional foods

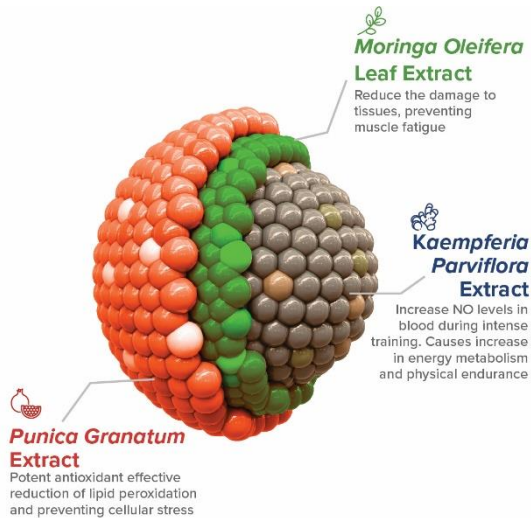
- A 100% plant based (No Excipients, Fillers, etc)
- Multiple actives with standardized assays
- Ability to provide organic offerings (Where organic sources possible)
- Clinical support illustrating improved bio-availability (>17x) and efficacy
- One (Mono Herbal) or multiple (Poly Herbal) plant sources can be utilized in one ingredient matrix
- Multiple Actives can be in the core of a PNS ingredient
- Highly stable with a 2 year shelf life
- Customizable particle size (Granulations / Fine Mesh)
- Can be used in capsules, tablets, softgels, powders, and gummies



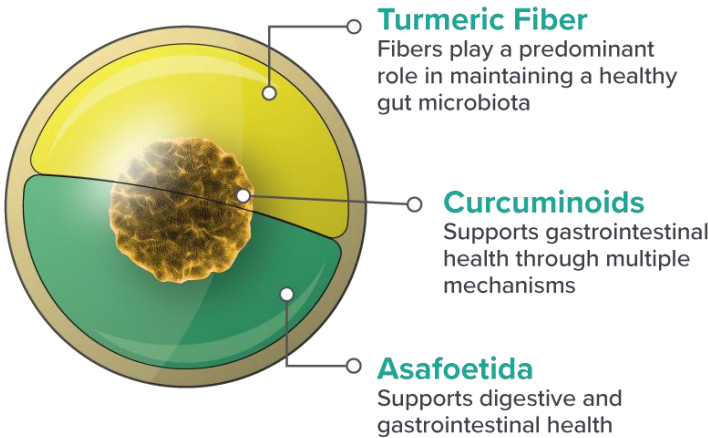
Active	Standardization
Curcuminoids	45-50%
Volatile Oil	3-8%
Protein	1-5%



Active	Standardization
6-Gingerols	12 - 16%
8-Gingerols	1 - 4%
10-Gingerols	2 -4%
6-Shogaols	3.5%
8-Shogaols	1%
Volatile Oil	1%-3%



Active	Standardization
Saponins	20-25%
Total Polyphenols	12-16%
Total Methoxy Flavones	10-12%
Rosmarinic Acid	> 0.5%



Active	Standardization
Fiber	> 20%
Curcuminoids	2-5%
Volatile Oil	>1%

ACUMIN[®]

Beyond Bioavailable



45% CURCUMINOIDS

POLYSACCHARIDE

TURMERIN PROTEIN

DIETARY FIBER

TURMERONE OIL

Standardization

NLT 45% Curcuminoids
1-5% Protein (As Turmerin)
3-8% Volatile Oil

Dose

300 - 500mg

Features

Excipient Free, 200+ nutrients, Non GMO, Vegan,
Organic Available, Enhanced Bioavailability

Benefit Categories

Joint Health, Stress, Active Nutrition

No. of Clinical Studies

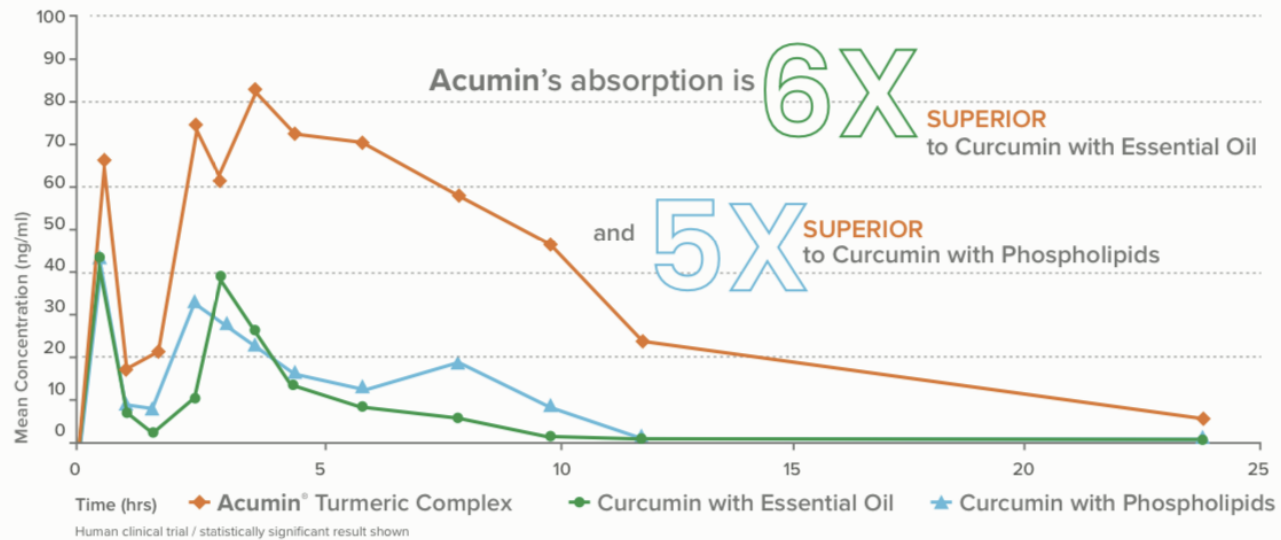
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Upcoming Research

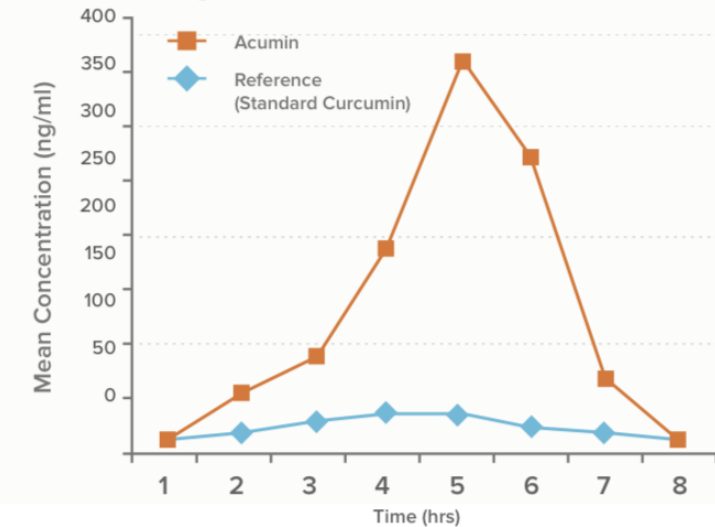
A low dose, 150 subject study on stress

ACUMIN[®]

Beyond Bioavailable



Test against standard curcumin 95%



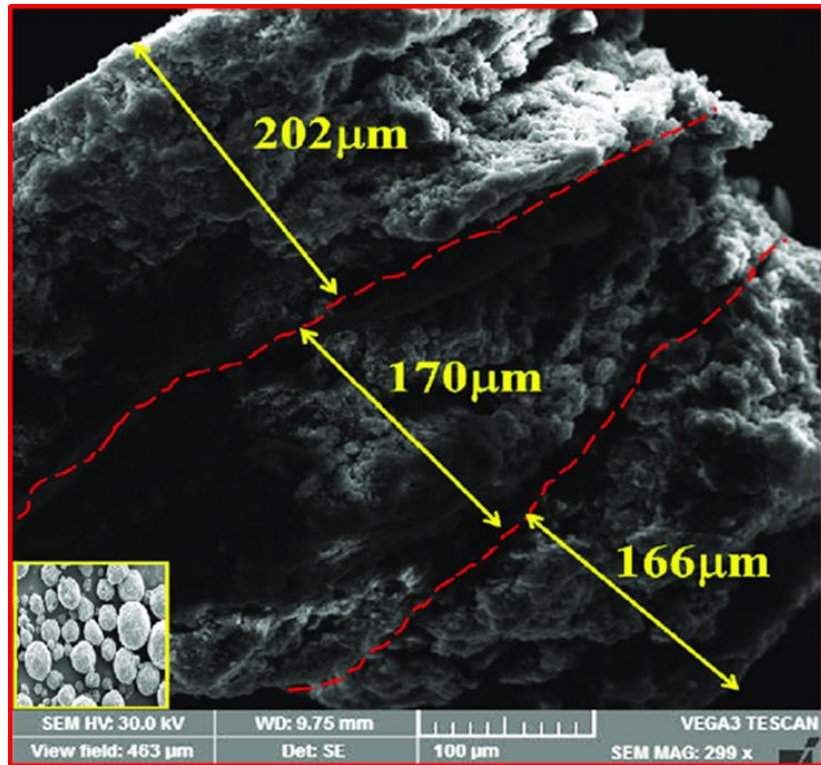


PUBLISHED

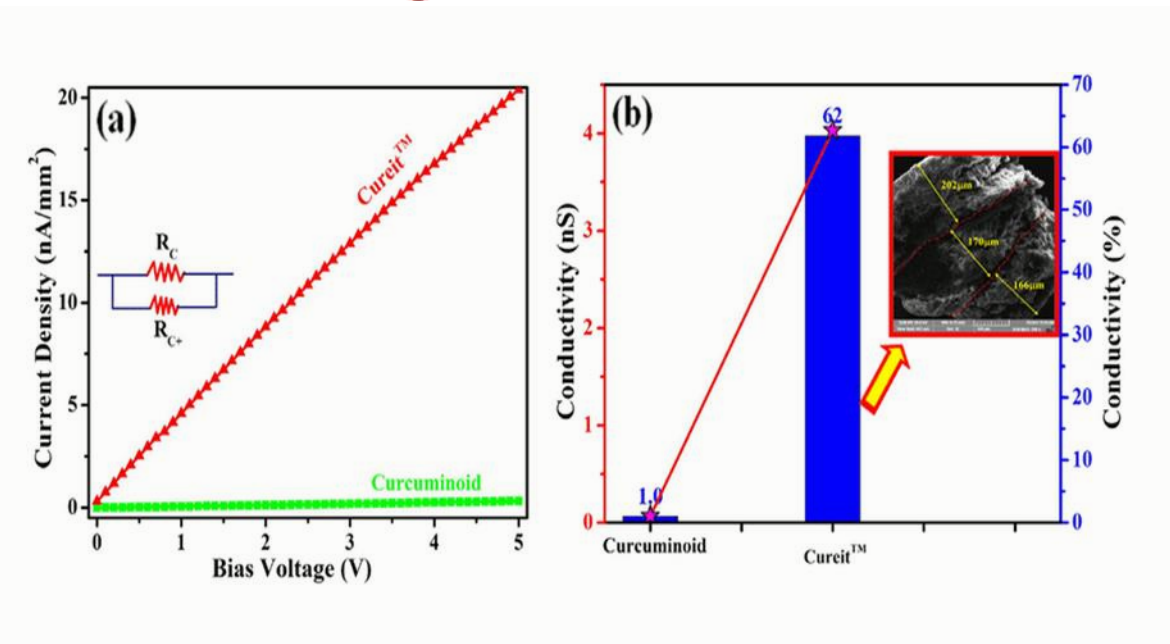
- Delayed Onset Muscle Soreness
- Sarcopenia
- Effects on Rheumatoid Arthritis
- Effects on Osteoarthritis
- Pk study against standard 95% curcumin
- Pk evaluation against two curcumin + essential oil and curcumin phytosome

PENDING PUBLICATION

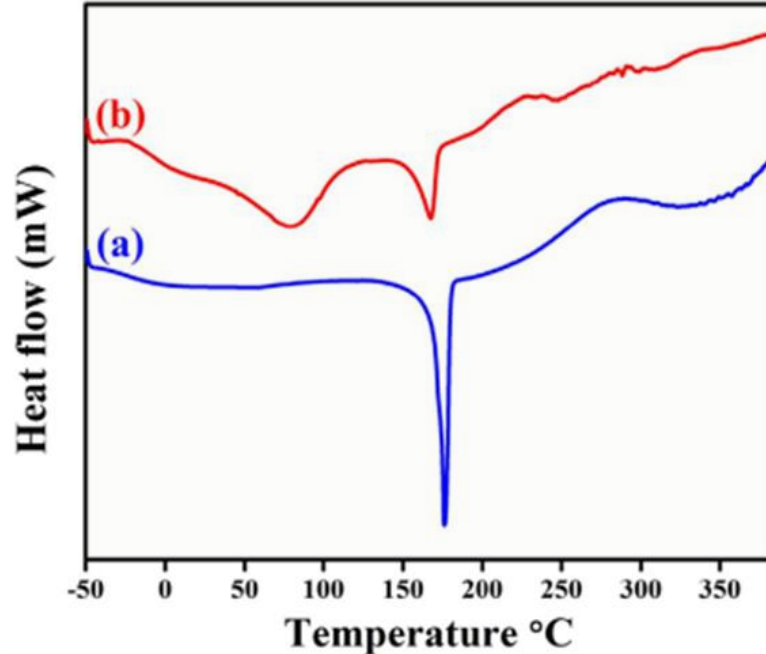
- OSMF Study
- Pk evaluation against two competing ingredients and an IV administered curcumin



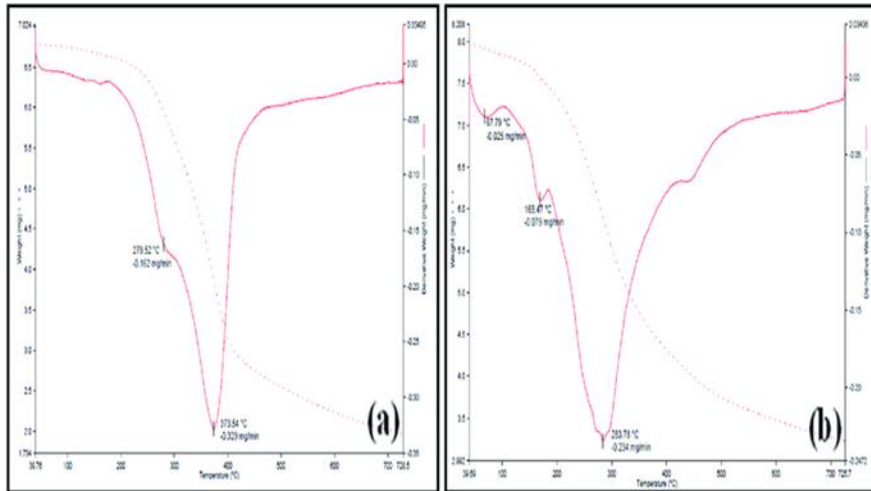
- Scanning Electron Microscope (SEM) analysis was conducted to investigate the morphology of PNS matrix of Acumin. It was evident from SEM image that the formulation was almost spherical and well dispersed with rough morphology (Fig. insert)
- The mean diameter is in the range of 400–600 μm. The figure clearly indicated the presence of three different layers with slight morphological modifications. It might be the characteristic morphology of Polar-Non-polar-Sandwich technology.



- Current-voltage curve (I-V curve) is a relationship represented as a graph between the electric current through a material and the corresponding voltage difference across it.
- The I-V study shows that the conductivity of the PNS product is being increased by 1:62 ratio than the free active molecule (Fig. a) due to the presence of layered structure (Fig. b).
- Current-voltage studies on different layers of PNS showed that is highly positive, that is PNS product conducts electricity.
- This is attributed to the incorporation of polar and non-polar matrix, which is an evidence of the PNS technology.



- Stability, crystallinity and polar-nonpolar interactions were evaluated by differential scanning calorimeter (DSC) analysis.
- DSC analysis showed a sharp endotherm peak at 176.7°C for curcuminoid (Fig. a) corresponding to the melting point of crystalline region.
- In the case of PNS product, the endothermic peak was at 167.7°C for biomolecule, curcuminoids. This peak is broader with reduced intensity and shifted to lower temperature due to the presence of polar and non-polar matrix (Fig. b).
- The thermogram of Acumin also showed a small broad endothermic peak at around 79.3°C corresponds to the melting of polar and non-polar matrix and loss of residual moisture. This showed the higher heat stability of the PNS product (Acumin) over curcumin.



- Thermogravimetric analysis (TGA) curves of curcuminoid (Fig a) does not show any stage of water loss up to 200°C due to its high hydrophobicity. It shows a gradual weight loss with first weight loss at 279.5°C and second at 373.5°C.
- Acumin (Fig b), the first degradation step due to elimination of moisture from the polar matrix occurs at 67.8°C while the second degradation step at 168.5°C corresponds to the breakage of protein chain present in the polar layer.
- The third weight loss is recorded at 283.8°C and corresponds to the degradation of available curcuminoid in the Acumin. Curcuminoid and Acumin show almost similar weight loss pattern in the range between 279 and 284°C.
- Thus TGA is also confirmed that curcuminoid encapsulated by PNS technology in Acumin.



ACUMIN[®]
Beyond Bioavailable

AlphaNRG[™]

ACTBIOME[®]

FITNOX[®]
SPORTS NUTRITION

acu[®]
joint
HEALTHY JOINTS

Cognique[®]


Ginactiv[®]