Spices—A Journey From Flavour And Colour To Preventive Healthcare

European Spice Association—Annual Meeting General Assembly
Sanjaya Mariwala | June 1st, 2017 | Bordeaux
Spices: Food, aroma, medicinals and currency

- Flavour, colour and preservation
- Culinary importance
- Religious and cultural significance
- Currency drivers of the ancient trade—“spice routes”
- Medicine
- Therapeutic foods
Spice routes

Spice trade was one of the earliest drivers of globalization

- **3000 BC—200 BC**
  Arabs traded spices and herbs among early civilizations

- **1200—1500**
  Europeans explore passages to the East Indies

- **1400—1700**
  Wars for control of the spice trade break out

- **1500—1900**
  English exploration begin

- **1800—1900**
  Americans enter the spice trade
Focus: Science and research on bioactives of spices have supported their health benefit claims

- **Spices and bioactives**: Spices contain plant-derived chemical compounds/bioactives known to have disease preventing and health promoting properties.

- **Claim substantiation**: Research backed by clinical studies across demographics and regions have helped substantiate these claims.

- **Multiple spices for multiple benefits**: Chronic conditions like heart health and diabetes to antioxidant, anti-inflammatory. Key spices—cinnamon, chili peppers, turmeric, garlic, oregano, basil, thyme, and rosemary.
Health areas—A plethora of benefits in science

Health and wellness with spices

- Eye, skin, mental health
- Cancer, dyspepsia, metabolic
- Cardiovascular, diabetes
- Liver, neurogenerative
- Asthma, immune, inflammatory
- Osteoarthritis, wound healing
Spice-based products potential health benefits for a variety of benefits and claims

<table>
<thead>
<tr>
<th>Spices</th>
<th>Marketed health benefits</th>
</tr>
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<tbody>
<tr>
<td>Curcumin/Turmeric</td>
<td>Anti-inflammatory, antioxidant, cardiovascular health, metabolic health</td>
</tr>
<tr>
<td>Ginger</td>
<td>Digestive health, nausea, antioxidant, joint health, immune health, general metabolic health</td>
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<tr>
<td>Chilli Peppers</td>
<td>Weight management and sports nutrition</td>
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<tr>
<td>Cinnamon</td>
<td>Anti-inflammatory, metabolic health, glucose health, cardiovascular health</td>
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<tr>
<td>Cumin</td>
<td>Anti-inflammatory, immune health, digestive and cardiovascular health</td>
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<tr>
<td>Basil</td>
<td>Anti-stress, anti-aging, immune support</td>
</tr>
<tr>
<td>Garlic</td>
<td>Antioxidant, cardiovascular health, immune support</td>
</tr>
</tbody>
</table>
Applications in dietary supplements

Spice based products are widely available
Spices and biomarkers: Structure and functional Targets

Three types of biomarkers are needed to evaluate the effects of spices

1. Exposure
2. Effect
3. Susceptibility
Innovation across the value chain

Value adds for enhancing benefits of spices

- Innovation in sustainable agricultural practices
- Innovation in extraction capabilities
- Innovation based on nutrigenomic studies using DNA Microarray
- Innovation in manufacturing capabilities
- Innovation in delivery platforms
Stages in Product Innovation for Spices—An Overview

1. Traditional spices
2. Tradition medicines
3. Extraction/Purification/Isolation
4. Effects and mechanism of action
5. Preclinical nutrigenomics *in vitro* and *in vivo* studies to link spices and their health benefits
6. Clinical testing—*in vitro* to human subjects
7. Formulating for dietary supplements
Success = technological and scientific innovation with active compounds in spices
Technology Innovation: Using UltraSOL™ technology for bioavailability enhancement

Concern
• Bioavailability enhancement
• Curcumin

Technology Innovation
• Bioavailability enhancement achieved by using UltraSOL technology

Approach
• Food grade polymers along with Curcumin spray dried to achieve particle size at submicron level along with encapsulation
• Delivery of increased bioavailable product
• Preservation of natural aroma, taste and efficacy
Technology Innovation: Using OmniBead™ technology for taste masking and time release

Concern

• Highly pungent
• Difficult to deliver the active ingredient without causing any GI irritation

Approach and Innovation

• Taste masking and time release achieved by layering with functional polymers using OmniBead Technology as a result of which:
  – Pungency of the material was also masked. It was timed to be released in the lower part of gut where maximum efficacy is achieved without causing distress
Innovation in delivery platforms—Expanding Markets

Applications

- Hard boiled candy
- Pectic jelly
- Gelatin gummies
- Mouth pour

Active ingredient (spice)

- Curcumin and Ginger
- Curcumin, Ginger and Capsicum
Nutrigenomics of spices

1. Effects of spices on gene expression of key proteins established through DNA microarray

2. QPCR based study of gene expression of turmeric, cinnamon, ginger, mango ginger, capsicum

3. Protein-ligand docking studies completed for turmeric and paprika extracts—pioneering work by OmniActive

4. Drug-discovery type enzyme inhibition studies on clove extracts to discover new health benefits for the eyes
OmniActive’s research facilities

Centres at Pune, Mumbia (India) and PEI (Canada) adding value to spices through research and innovation
Scientific and technological innovation brings out unique actives and health benefits of spices

Science
• Clinical relevance

Technology
• Bioavailability
• Functionality
• Stability

Health benefits

Consumer relevance
Spice product based case studies
Turmeric/Curcumin (Curcuma Longa l)

FEATURES

• Potent antioxidant
• Anti-inflammatory
• Neuroprotection
• Modulation of a multitude of genes
• A total of over 10,000 publications on curcumin research*
• ~180 clinicals on curcumin*

*Based on available data in PUBMED [accessed on 05/28/17)
• Traditional usage in Asian medicine coupled with growing body of science has propelled consumer interest for this spice
• Last year, turmeric/curcumin total ingredient sales held #1 spot in sales for third year in a row
• By 2020, market estimates indicate the finished supplement market are expected to grow to $425-$450 in US alone given a CAGR of 16.3 to 17.6%
• Largest growth driver—usage in dietary supplements
• Newer formats driving growth- turmeric lattes, curcumin gummies and curcumin shots

Turmeric/Curcumin (Curcuma Longa L)

TECHNICAL CHALLENGES

- Oil soluble/practically insoluble in water
- Large doses needed
- Poor bioavailability
- Mostly metabolites detected in plasma
- Rapid metabolism
- Rapid system elimination
Turmeric/Curcumin (Curcuma Longa L)

SOLUTIONS

- Nanoparticles
- Solid lipid nanoparticles
- Liposomes
- Microemulsions
- Food excipients, natural antioxidants
- Recent study compares commercial products side by side
- Crossover, statistically powered
- Robust statistical analysis and analytical methods

![Graph showing CurcuWIN™ significantly increased relative absorption of total curcuminoids by 46x over standard.](image-url)
Red Chili Pepper (*Capsicum*)

**FEATURES**

**Weight management**
- >25 clinical studies
- Appr. 1000 human subjects
- 1-10 mg capsaicinoids alone or in combination

**Clinical endpoints**
- Thermogenesis
- Energy expenditure
- Lipolysis
- Body composition

**Capsaicinoids:**
Major pungent principles in red chili pepper

- Capsaicin
- Di-Hydro Capsaicin
- Nor-Di-Hydro Capsaicin
Red Chili Pepper (Capsicum)

TECHNICAL CHALLENGES

Production constraints
- Cross-contamination
- Irritation of eyes, skin, lungs

Consumer issues
- Highly pungent
- Unbearably hot
- GI irritation
Red Chili Pepper (Capsicum)

SOLUTIONS

Encapsulated powder
• Facilitates gradual release in intestine
• Minimizes irritation
• Well tolerated
• Safety established
Ginger

FEATURES

• Gingerols, shogaols, zingergone, volatile oils- bioactives
• Growing opportunity
• Ginger sales rose from $39 mil in 2006 to $64 mil in 2014 (NBJ, 2015)
• A total of over 2755 publications on ginger research*
• Health and wellness, immune health, sports nutrition, digestive health and nausea, joint health, anti aging

*Based on available data in PUBMED [accessed on 05/28/17]
Ginger
SOLUTIONS

Manufacturing technology
• High potency, super-critical CO₂ fluid extraction
• Made with a CO₂ extraction process, without the use of harsh solvents

Delivery technology
• Clinically relevant dose in one small pill
• High potency to replace standard ginger—60mg Gingever ≈ 1,000 mg
• Encapsulated options to taste-mask
Spices have an established consumer credibility thanks to history of usage in multiple areas.

Research and innovation in science and technology is helping validate and substantiate these benefits.

The consumer interest is growing and so is the market opportunity.

Industry players need to focus on innovation across the value chain to ensure challenges are addressed and innovative spice based products reach consumers.
Thank You