Technical Developments in the Use of Spices

Dr David Baines
Baines Food Consultancy Ltd

Co-editor: Flavour Horizons
TECHNICAL DEVELOPMENTS IN THE USE OF SPICES

TOPICS:

Recent health claims submitted to the EU for the use of spices
Compounds in selected spices that have beneficial effects on health
The use of spices to inhibit of carcinogen formation in cooked meats
The growing use of spices in animal feeds
Salt reduction using spices
Interesting culinary herbs from Vietnam
Recent Health Claims Submitted to the EU
EU REGULATION OF HEALTH CLAIMS

- The Nutrition and Health Claims Regulation, 1924/2006/EC is designed to ensure a high level of protection for consumers and legal clarity and fair competition for food business operators.

- Claims must not mislead consumers; they must be, accurate, truthful, understandable and substantiated by science.

- Implementation of this Regulation requires the adoption of a list of permitted health claims, based on an assessment by the European Food Safety Authority (EFSA) of the science substantiating the claimed effect and compliance with the other general and specific requirements of the Regulation.

- This list of permitted health claims was adopted in May 2012 by the Commission and became binding on 14th December 2012. Food companies must comply from this date or face prosecution for misleading marketing.
APPROVAL OF CLAIMS

4,637 Claims IDs submitted to EFSA

2,758 claims IDs covered in 341 EFSA opinions

222 claims approved (covering 497 IDs)
- Allowed from 14 December 2012

Over 1600 IDs rejected
- Prohibited from 14 December 2012

64 IDs on hold because of no decision yet

91 IDs on hold for further assessment
- Allowed until decision taken

1548 claims IDs relating to Botanicals

2078 IDs on botanicals on hold
EU REGULATION OF HEALTH CLAIMS

CLAIMS BY COMPONENT

Vitamin/mineral: 76%

Whole food: 3%
Amino acid/derivative: 1%
Fatty acid: 3%
Fibre/polysaccharide: 7%
Microorganism: 0%
Other: 9%
Plant/botanical: 1%
<table>
<thead>
<tr>
<th>SPICE</th>
<th>CLAIM(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anise / Star Anise</td>
<td>Respiratory Health, Digestive Health, Immune Health, Lactation</td>
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<tr>
<td>Caraway</td>
<td>Digestive Health, Immune Health, Lactation</td>
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<tr>
<td>Cardammon</td>
<td>Respiratory Health, Digestive Health, Immune Health, Kidney Health, Nervous System Health, Cardiovascular Health,</td>
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<tr>
<td>Capsicum</td>
<td>Thermogenesis, Increasing Energy Expenditure, Enhancing Loss of Calories, Body Weight Loss, Stomach Health, Reduction of Oxidative Stress, promotion of Hair Growth.</td>
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<tr>
<td>Cassia</td>
<td>Intestinal Health</td>
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<tr>
<td>Cinnamon</td>
<td>Digestive Health, Immune Health, Appetite</td>
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<tr>
<td>Fennel</td>
<td>Respiratory Health, Lactation, Gastro-intestinal Health,</td>
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<tr>
<td>Fenugreek</td>
<td>Appetite, Glucose Metabolism</td>
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# CLAIMS FOR SPICES – NOT APPROVED/ON HOLD

<table>
<thead>
<tr>
<th>SPICE</th>
<th>CLAIM(S)</th>
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<tbody>
<tr>
<td>Ginger</td>
<td>Respiratory Health, Digestive Health, Immune Health, Heart Health,</td>
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<tr>
<td></td>
<td>Management of Inflammatory Properties, Well-being During Travelling,</td>
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<td>Garlic</td>
<td>Stress Reduction, Immune Health, Heart Health, Blood Lipids, Liver Health,</td>
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<td>Antioxidant Properties</td>
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<tr>
<td>Onion</td>
<td>Antioxidant Properties, Glucose Metabolism, Lipid Metabolism</td>
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<tr>
<td>Piper nigrum (Black Pepper)</td>
<td>Respiratory Health, Digestive Health, Immune Health, Reproductive System,</td>
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<td>Nervous System Health, Antioxidant Properties</td>
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<tr>
<td>Piper longum (Long Pepper)</td>
<td>Digestive and Bioavailability, Immune Health, Adoptogenic and Mental</td>
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<td>Health, Stimulant</td>
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<td>Rosemary</td>
<td>Antioxidant Properties, Digestive Health, Immune Health, Invigoration of</td>
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<tr>
<td></td>
<td>the Body, Hepatic and Biliary Health</td>
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<tr>
<td>Sage</td>
<td>Respiratory Health, Digestive Health, Immune Health, Stomach Health,</td>
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<td>Antioxidant Properties, Menopause, Cognitive Performance.</td>
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<tr>
<td>Thyme</td>
<td>Antioxidant Properties, Respiratory Health, Immune Health, Health of</td>
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<td>Upper Respiratory Tract</td>
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<tr>
<td>Turmeric</td>
<td>Intestinal and Digestive Health, Management of Inflammatory Responses,</td>
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<td></td>
<td>Antioxidant Properties</td>
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</table>
Compounds in Spices with a Beneficial Effect on Health
PUNGENT COMPONENTS OF SPICES

- Piperine
- Capsaicin
- Gingerol
- Shogoal
- Sanshool
- Hydroxy Sanshool
Sichuan peppers
Northern China. Unique acidic peppery flavour with tongue tingling characteristics. Component of 5-spice and a main component of Szechwan dishes.

Andaliman peppers
The antidepressant activity of piperine results from its ability to stimulate the synthesis of serotonin. In patients with epilepsy a common co-morbidity is depression and a elevation in serotonin levels counters this mood disorder.

Piperine has also been shown to improve the digestion of important food chemicals, for example, the absorption of beta-carotene. Significant increases (60%) in serum beta-carotene occurs during supplementation of orally administered beta-carotene with piperine.
Long pepper was known to the ancient Greeks and Romans but is a very rare ingredient in European cuisine today. It can still be found in Indian and Malaysian dishes.

The major component, piperlongumine, was reported to selectively kill cancer cells following research at the Massachusetts General Hospital. ‘The novelty of this compound is that it is able to discriminate cancer cells from normal cells.’

The combination of piperine and piperlongumine is the subject of a patent claiming that the mixture improves cognitive functions such as learning, memory, alertness as well as relieving psychosocial pressure.

PGNTER – ASTHMA RELIEF

Purified components of ginger work synergistically with asthma medicines to relax airway muscle tissues. 6-Shogaol was found to be the most effective. It was established that it inhibits the enzyme phosphodiesterase which plays a central role in muscle relaxation processes and helps asthma sufferers breathe more easily.

‘Active Constituents Of Ginger Potentiate β-Agonist-Induced Relaxation Of Airway Smooth Muscle’
Authors: E.A. Townsend, et al; Columbia University
Potent inhibitor of human platelet aggregation and is protective against thrombosis. It is claimed that this compound is four-fold more potent than aspirin at inhibiting human platelet aggregation.

‘Chemistry of ginger constituents and inhibitory factors of the arachidonic acid cascade’.
Dietary Ginger Constituents, Galangals A and B are potent apoptosis inducers in Human T Lymphoma Jurkat Cells.

Galangals A and B isolated from the flower buds of a Japanese ginger produced apoptotic cell death of human lymphoma cells showing them to be potent anti-cancer agents.
Zingerone has been shown to be active against enterotoxigenic E. coli heat-labile enterotoxin-induced diarrhea. This type of diarrhea is the leading cause of infant death in developing countries. It inhibits spontaneous contractile movements in the bowels by direct action on the smooth muscles. Chen et al. J. Agric. Food Chem., (2007) 55(21), 8390-8397

Old English Word: Feague (verb). To increase the liveliness of a horse by inserting peeled raw ginger into its fundament.
‘Capsaicin has a profound anti-proliferative effect on human prostate cancer cells and dramatically slows the development of prostate tumours’. It appears to selectively attack tumour cells leaving the healthy cells alone by inhibiting the protein involved with prostate cancer cell proliferation.

The inhibitory effects of capsaicin on cancer development in multiple organs, such as, stomach, lung, and liver have been extensively documented.

CAPSAICIN / CAPSIATE AND WEIGHT LOSS

Capsaicin has also been used in diet strategies claiming that it speeds up metabolism and burn fat leading to weight loss. The amount needed to achieve this has side effects.

Marketed by Ajinomoto (FI Japan 2012). Weight loss product Capsiate Natura is claimed to deliver the thermogenic punch of capsaicin without the pungency and adverse side effects. The peppers producing them are grown in Thailand in farms operated by Ajinomoto and the capsinoids are extracted, purified and encapsulated. The product has been available in Japan since 2006 and was granted US FDA approval in 2007.
TURMERIC AND ALZHEIMER’S DISEASE

During the past decade attention has focussed on turmeric and its colour compound curcumin for the prevention of cognitive loss and as a way of combatting the onset of Alzheimer’s disease.

0.3% of the population of India suffer from Alzheimer’s disease – in the USA it is 1.6%.

Curcumin in turmeric is consumed on a daily basis in India and recent work with mice has shown that it inhibits and reverses the formation of amyloid plaques responsible for the disease.

PUNGEENT SPICES - CLUES IN THE STRUCTURE?

Piperine

Piperlongumine

Capsaicin

Gingerol

Shogoal

Curcumin
The Use of Spices to Inhibit Carcinogen Formation
Carcinogens and mutagens (heterocyclic aromatic amines) are formed in meat when it is cooked. Well done and BBQ meats contain the highest levels.

In comparison to other known food mutagens it is now known that these compounds are over 100 fold more mutagenic than Aflatoxin B1 and 2000 fold more mutagenic than the polycyclic hydrocarbon benzo[a]pyrene responsible for lung cancer in smokers.

In the diagram:
- **N** represents the nitrogen atom.
- **R** is a variable representing the substituent group.
- **R1, R2, R3** are different substituent groups that can vary.
- **H** represents a hydrogen atom.
- **CH3** represents a methyl (three carbon) group.
- **IQ**, **MeIQ**, **AaC**, and **MeaC** are specific molecular structures.
- **PhIP** is shown in its molecular structure.
- **R1, R2, R3 = H (IQ)**
- **R = CH3 (MeIQ)**
- **R1, R2, R3 = H (MeIQx)**
- **R1, R2 = CH3, R3 = H (4,8-DiMeIQx)**
- **R1, R2 = CH3, R3 = H (7,8-DiMeIQx)**
- **R1, R2, R3 = H (8-MeIQx)**
- **R1, R2, R3 = H (7-MeIQx)**
- **R = H (AaC)**
- **R = CH3 (MeaC)**
- **R = H (7-MelgQx)**
- **R = CH3 (7,9-DiMeIQx)**
Two EU assessment studies have determined human exposure at 103 and 160 ng/day. Over the past 15 years an increasing number of epidemiological studies have evaluated the association of well-done meat intake and meat carcinogen exposure with cancer risk. These studies were reviewed by Zheng and Lee.

*Well-done meat intake, heterocyclic amine exposure and cancer risk.*  
*Nutrition and Cancer, 61(4), pp 437-446*

<table>
<thead>
<tr>
<th>Exposure</th>
<th>No. of Studies Evaluated</th>
<th>No. of Studies Reporting Positive Associations %</th>
<th>Cancers Implicated</th>
</tr>
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<tbody>
<tr>
<td>HAAs General</td>
<td>10</td>
<td>7 (70%)</td>
<td>Colorectal, breast, pancreatic, stomach, esophagus, squamous cell carcinoma, lung.</td>
</tr>
<tr>
<td>PhIP</td>
<td>13</td>
<td>8 (61.5%)</td>
<td>Colorectal, breast, pancreatic.</td>
</tr>
<tr>
<td>MelQx</td>
<td>12</td>
<td>6 (50%)</td>
<td>Colorectal, lung.</td>
</tr>
<tr>
<td>DiMelQx</td>
<td>11</td>
<td>6 (54.5%)</td>
<td>Colorectal, pancreatic.</td>
</tr>
</tbody>
</table>

PhIP, MelQ, MelQx and IQ are now listed in the IARC Report on Carcinogens
PhIP is formed in the highest amounts and is usually responsible for around 80% of the aromatic amines present in cooked meat products. It is listed on the IARC list of carcinogens. It’s route of formation is understood;
THE GOOD NEWS INVOLVES SPICES

A recent study evaluated the use of black pepper in meat balls fried at three different temperatures (175°C, 200°C and 225°C). The black pepper was shown to completely eliminate the PhIP at all temperatures against a control containing no black pepper. The control sample cooked at 225°C contained 31.8ng/g of HAAs. (PhIP. F. Oz and M, Kaya, (2011) Food Control, Vol 22, pp 596-600)

Marinade application to the surface of meat prior to cooking can have a significant effect on HAAs. A mixture of rosemary, thyme, sage, and garlic in brine reduced the overall content by 60% compared to a non-marinated control. Marinades based on sugar can increase the content of heterocyclic aromatic amines in fried beef. Turmeric, garlic and onions have also been shown to reduce heterocyclic amines.
The Growing Use of Spices in Animal Feeds
SPICES IN ANIMAL FEEDS

Herb and spice blends, essential oils and flavourings have been used in animal feeds for decades.

• Growth performance and health of pigs and piglets during farrowing and lactation.
• Masking agents in cattle and horse feeds were added for the benefit of the farmer.

The position has now changed considerably, especially over the past decade, and research has focussed on the use of herbs and spices across a range of farm animals to improve gut and rumen health and increase performance and yield.

This has been partly driven by the ban by the EU on most antibiotic growth promoters due to cross resistance against pathogens and residues in tissues.

Animal scientists have turned their attention to search for alternatives to antibiotics and herbs and spices feature significantly in this work.
SPICES IN RUMINANT FEEDS

Over the past decade there have been numerous studies showing the beneficial effects of herbs and spices on feed, intake, immune function, rumen fermentation, methanogenesis, the productivity of calves, dairy cows, heifers and beef cattle.

Cinnamon, anise, oregano, garlic, capsicum and yucca show beneficial effects on rumen fermentation.

Caraway, camomile, nettles, dandelion, and common agrimony improve the quality of milk.

Garlic and eucalyptus are effective against endometritis (inflammation of the uterus)

A mix of cloves, cinnamon and garlic has been recently patented to reduce the production of methane from dairy cows.

SPICES IN PIG FEEDS

Pigs are omnivores with similar taste senses to humans. Their feeding behaviour and feed intake can be affected by flavours such as apple and strawberry and they have a liking for the heat of capsaicin. More recently attention has moved from pig flavour preferences to ingredients that improve health and thereby improve performance. The pig still has to enjoy the taste though.

In pig production most problems can be expected at farrowing and weaning. The use of herbs and spices in piglet nutrition has been shown to reduce the incidences of infections and reduce mortality over this critical period.

A mixture of cinnamon and garlic increases feed intake and live weight gain in weaned piglets and reduces mortality.

Oregano, cinnamon, thyme and capsicum reduce gastrointestinal problems in weaned pigs.

Imprint flavours have been used to facilitate weaning.
SPICES IN POULTRY FEEDS

The use of herbs, spices, flavours in chicken feeds was previously unheard of but it is now a growing area of research.

Three main areas are emerging:

1) Growth performance – various mixtures of oregano, clove, anise, cinnamon, thyme, rosemary and capsicum have been shown to produce significant improvements in feed conversion and body weight gain in chickens. Anise alone at 1% in a feed significantly improved daily live weight gain over a 6 week period and it is suggested that it is a natural growth promoter for poultry.

2) Egg Production – dietary supplementation with ginger produced a higher egg mass, and improved egg yolk antioxidant status

3) Meat – the use of oregano in turkey and chicken feeds significantly decreases lipid peroxidation of cooked and fresh meat during refrigerated storage.
Spices and Salt Reduction
SPICES AND SALT REDUCTION

• The WHO has stated that salt reduction is of equal importance to smoking cessation.

• The UK Government is actively pursuing a salt reduction strategy with a target of 6g/person/day above the age of 11 years.

• The NICE report of 2010 recommends that salt reduction is accelerated and the target achieved by 2015.

• Currently (March 2013) 90 companies have signed up to make salt reduction a priority.

• The UK now has the lowest salt intake of any developed country in the world (June 2012) at 8.1g/day down from 9.5g/day in 2005.
Food and Beverage Flavour Patents 2010-12

- Flavour compounds: 60
- Enzyme synthesis: 46
- Umami: 37
- Salt reduction/enhancers: 53
- Bitter taste maskers: 52

Source: http://worldwide.espacenet.com

(espa)
SPICES AND SALT REDUCTION

A patent filed in 2012 by House Foods Corporation, Osaka Japan, claims the use of a number of spices in salt reduction formulations enhances the salty taste of sodium chloride and serves to mask the bitter notes of potassium chloride.

**Spices:** White pepper, black pepper, green pepper, ginger, zanthoxylum, capsicum, cumin, thyme, oregano, coriander, laurel, cardamon, mustard, cinnamon, garlic, rosemary, sage, basil, citrus unshiu peel, perilla and lemon and extracts of the above.

The examples cite only white pepper. In salt blends containing sodium chloride, potassium chloride, acetic and lactic acids the white pepper (< 0.05% )enhances the salty taste producing good salty character compared to a sample without white pepper.

Clearly if spices do have a role in enhancing salty character they could be used quite easily in the relevant dishes.

It may also be worthy of industry sponsored research.
Interesting Herbs and Spices
PHO SOUP – PASTEUR RESTAURANT
HO CHI MINH CITY
PHO SOUP
Herbs of Pho Soup

HOLY BASIL

Ocimum tenuiflorum

BASIL

Ocimum basilicum

Aromatically, holy basil has basil, clove and liquorice character
Herbs of Pho Soup

*Limnophila aromatica* is used in Vietnamese dishes including Pho Soup along with other herbs to produce a unique and delicious dish.

It has a rosemary, citrus and cumin character.

It grows across S. E Asia in watery environments hence its other name – Rice Paddy Herb.
Thank You and
I will leave you with
the spicy herbal
smells of Vietnam

www.flavourhorizons.com