Mr Peter Gaubinger
Director Business Development, Phytobiotics Feed Additives GmbH, Germany

Phytogenic feed additives – black box or reliable products!

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Phytogenic Feed additives

Black box or reliable products?

Peter Gaubinger Ing. agr.
Phytobiotics Feed Additives
Eltville
Germany
Overall view

1. Definition

2. Regulatory affairs

3. Mode of action – effects in animal nutrition

4. Requirements for reliable and successful use

5. Conclusion
Definition

Phytobiotica

Plant feed materials

Herbs

(Plant Extracts)

Spices

Oleoresins

Phytogenic feed additives

Essential oils

(Botanicals)
Definition

**BOTANICALS**
= grounded plants or parts of plants as roots, seeds

**ESSENTIAL OILS**
= volatile, natural vegetable products extracted from herbs and spices by steam distillation

**OLEORESINS**
= less volatile, natural vegetable products extracted from herbs and spices with a non-aqueous solvent

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Active principles = Secondary plant metabolites

**Secondary plant metabolites** are bioactive substances which can have a potential value as feed additives in animal nutrition.
Definition

**Active principles in phytogenic feed additives**

**Basic plant metabolites**

**Example**
- Water
- Carbohydrates (Glucose)
- Protein
- Vitamins
- Minerals

**Function/characters**
- high concentration in the plants
- part of the basic metabolism
- nutrients

**Secondary plant metabolites**

**Example**
- Essential oils
- Bitter substances (Alkaloids)
- Colorants (Carotinoides)

**Function/characters**
- 5000-10000 substances
- low concentration in plants
- not a part of the basic metabolism
- interaction with other plants and insects/defense mechanisms/growth regulators
- bioactive substances
Regulatory affairs

**Status quo**
- Feed additives are regulated in accordance to EC No. 1831/2003
- all phytogenic feed additives are notified in the sensory group

### Categories of feed additives (EC No. 1831/2003)

<table>
<thead>
<tr>
<th>Group</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological additives</td>
<td>Silage additives, ant caking agents</td>
</tr>
<tr>
<td><strong>Sensory additives</strong></td>
<td><strong>Colorants, Flavouring compounds</strong></td>
</tr>
<tr>
<td>Nutritional additives</td>
<td>Vitamins, Amino Acids, Urea</td>
</tr>
<tr>
<td>Zootechnical additives</td>
<td>Digestibility enhancers, Gut flora stabilizers</td>
</tr>
<tr>
<td>Coccidiostats and Histomonostats.</td>
<td></td>
</tr>
</tbody>
</table>

**Sensory additives**: any substance, the addition of which to feed improves or changes the organoleptic properties of the feed, or the visual characteristics of the food derived from animals.
**Regulatory affairs**

**Development**
- All feed additives have to go through a registration process
- for this companies have to hand in a complete dossier

⇒ depended on their mode of action phytogenic feed additives can apply for a registration in the sensory group or zootechnical group

Since Nov. 2004 all phytogenic feed additives are notified in the sensory group

Registration process
- Complete dossier
- Required until end of 2010

Approval by Commission

Regulation EC 1831/2003
(categories for feed additives)

1. Technological
2. Sensoric
3. Nutritional
4. Zootechnical
5. Anticoccidial und antihistomonal
Mode of action – effects in animal nutrition

Effects of phytogenic feed additives in animal nutrition

Stimulation feed intake
Antibacterial, coccidiostatic, anti-viral effects
Stimulation of the secretion of digestive enzymes
Stimulation immune system
Antioxidative effects

Higher feed intake
Improved growth
Better FCR
Improved carcass quality
Improved health status
### Mode of action – effects in animal nutrition

#### Stimulation Feed intake

Effect of different plant products on feed intake and growth performance

**Starter: Day 0-14**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Aloe Vera</th>
<th>Sangrovit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed intake (g)</td>
<td>487</td>
<td>475</td>
<td>476</td>
</tr>
<tr>
<td>Weight gain (g/d)</td>
<td>31,8</td>
<td>30,9</td>
<td>31,0</td>
</tr>
<tr>
<td>FCR</td>
<td>1,09</td>
<td>1,09</td>
<td>1,09</td>
</tr>
</tbody>
</table>

**Grower: Day 14-31**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Aloe Vera</th>
<th>Sangrovit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed intake (g)*</td>
<td>1758</td>
<td>1804</td>
<td>1844</td>
</tr>
<tr>
<td>Weight gain (g/d)*</td>
<td>65,0</td>
<td>67,4</td>
<td>71,2</td>
</tr>
<tr>
<td>FCR*</td>
<td>1,59</td>
<td>1,57</td>
<td>1,52</td>
</tr>
</tbody>
</table>

*Sannan, H.; Aglen, V. (2004).* The effect of new Sangrovit and Aloe Vera in broiler diets. Felleskjøpet Fôrutvikling, Trondheim, Norway
Mode of action – effects in animal nutrition

**Antibacterial properties**

- *in vitro* studies show the antimicrobial effects of many plant extracts
- results in the Literature quite variable, due to different product composition (often not described) and testing methods
- the scientific proof of these antibacterial effects *in vivo* is rare
- in comparison to AGP’s natural antibiotics are less selective and have often to be used in a high dosage to reach the same effect (can influence the feed intake negative)
- the unselective effects can harm the positive flora as well
Antioxidants

Mouth

Intermediary metabolism

Muscle and other tissues

Products

Large intestine

Mode of action – effects in animal nutrition

Antioxidative properties

Activity of Antioxidants in Farm animals

Mode of action – effects in animal nutrition

Immuno properties

• the intestine is the biggest immune organ in the body

• the use of immunemodulation phytogenic feed additives can play an important role in particularly stress situations (e.g. weaning)

• many in vitro studies show immunemodulation properties of phytogenic substances (Borchers et al., 1997; Craig, 1999), whereby these substances act mainly on non-specific humoral and cellular immunity system

• one of the most known plant for immunomodulatory effects,

• especially associated with virus infections, is Echinacea spp. (Tandon, D. 2001)

• another recognized active principle is Garlic (Allicin)

⇒ Immune system stimulating agents can increase in vivo the overall health status in the stable and by this lead to a reduced mortality and more stable performance.
Mode of action – effects in animal nutrition

Performance enhancing properties

Effects of a botanical on growth, performance and N-balance in growing pigs

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Sanguinarin</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain, g/d</td>
<td>796</td>
<td>821</td>
<td>Higher protein retention, higher weight gain,</td>
</tr>
<tr>
<td>FCR</td>
<td>2.24</td>
<td>2.16</td>
<td></td>
</tr>
<tr>
<td>N-excretion</td>
<td>100</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>N-retention</td>
<td>100</td>
<td>108</td>
<td>Higher protein retention, higher weight gain,</td>
</tr>
<tr>
<td>N-balance</td>
<td>100</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>Urea blood</td>
<td>100</td>
<td>76</td>
<td>Reduced detoxification for liver → more healthy liver</td>
</tr>
<tr>
<td>Ammonia blood</td>
<td>100</td>
<td>92</td>
<td></td>
</tr>
</tbody>
</table>

Mode of action – effects in animal nutrition

Performance and carcass quality enhancing properties
Effects of different botanicals on growth performance and carcass quality

**Growth Performance**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Sangrovit</th>
<th>Product A</th>
<th>Product B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight Start (kg)</td>
<td>30,5</td>
<td>27,0</td>
<td>30,8</td>
<td>30,7</td>
</tr>
<tr>
<td>Body weight End (kg)</td>
<td>102</td>
<td>107</td>
<td>106</td>
<td>108</td>
</tr>
<tr>
<td>Daily weight gain (g/d)</td>
<td>753&lt;sup&gt;a&lt;/sup&gt;</td>
<td>842&lt;sup&gt;b&lt;/sup&gt;</td>
<td>792&lt;sup&gt;c&lt;/sup&gt;</td>
<td>814&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>FCR</td>
<td>2,78</td>
<td>2,57</td>
<td>2,70</td>
<td>2,62</td>
</tr>
</tbody>
</table>

**Carcass quality**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Sangrovit</th>
<th>Product A</th>
<th>Product B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean meat content, %</td>
<td>54.95</td>
<td>55.90</td>
<td>55.85</td>
<td>56.05</td>
</tr>
</tbody>
</table>

Fuchs, B. (2005). University of Wroclaw, Akademia Rolnicza, Poland
Let's avoid the Black Box!!!

Requirements for a reliable and successful use of phytogenic feed additives

• Analyses/Product Standardization
• Proven technical and physical properties (e.g. heat stability)
• Safe in use (for workers, animals, consumers)
• Proven efficiency
• Known mode of action
• Knowledge about the bioavailability, pharmacology and metabolism of active principles

Tryptophan is a nutrient for microbes. Feeding Sangrovit = Sanguinarine inhibits the AAD (Dršata, J. et al.; 1996. Sanguinarine and chelerythrine as inhibitors of aromatic amino acid decarboxylase. *J. Enzyme Inhib.* 10, 231-237). Feeding Sangrovit enhances feed intake, feed conversion, and weight gain. It also increases serotonin secretion, leading to higher availability of amino acids and higher tryptophan concentration in blood. This results in improved nitrogen balance, higher carcass value, and liver health. The inhibition of AAD leads to increased tryptophan availability for microbes, resulting in the production of indole and skatol. Feeding Sangrovit also reduces the production of indole and skatol, which are known to have negative effects on feed intake and growth.
Effect of Sangrovit® on tryptophan availability in broilers
Itochu, Japan (2004)
Known mode of action

Effect of Sangrovit on tryptophan and lysine availability in pigs

![Graph showing the effect of Sangrovit on tryptophan and lysine availability in pigs.](image)

Conclusions

• Plant based feed additives represent one alternative the banned AGP’s
• These substances are not new, as they have been used since a long time in human nutrition and medicine
• A lot of *in vitro* and *in vivo* studies show their potential for animal nutrition

• Nether less this for a successful use in a long term view the following points should be demonstrated by the supplier of the additives:

  ✓ Product Standardization
  ✓ Proven technical and physical properties (e.g. heat stability)
  ✓ Safe in use (for workers, animals, consumers)
  ✓ Proven efficiency
  ✓ Known mode of action
  ✓ Knowledge about the bioavailability, pharmacology and metabolism of active principles
“Please visit us at the ADDCON stands 9 – 13”

Thank you for your attention