Feed additives and supplements for poultry

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Feed additives and supplements for poultry
## Broad classification of feed additives

<table>
<thead>
<tr>
<th>Growth promoters</th>
<th>Disease preventing agents</th>
<th>Supplements/Vitamins</th>
<th>Auxiliary substances</th>
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<tbody>
<tr>
<td></td>
<td>4. Immuno-modulators</td>
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<td>4. Buffers</td>
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<td>4. Emulsifiers</td>
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<td>5. Organic acids/Feed acidifiers</td>
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<td>5. Toxin adsorpants</td>
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<td>II. Biological</td>
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<td>1. Probiotics</td>
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<td>6. Preservatives</td>
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<td>2. Enzymes</td>
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<td>7. Pellet binders</td>
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</tbody>
</table>
Antibiotic growth promoters (AGP) in feed

The EU has banned Bacitracin, carbadox, olaquindox, tylosin, virginiamycin, avilamycin, flavophospholipol, lasalocid sodium, monensin sodium, and salinomycin as of 2009.

Government of India ban on colistin for use in poultry industry
AGPs in Feed – Field Survey

**Broiler Chicken**
- 10% of farms: Chlortetracycline or Oxytetracycline
- 90% of farms: Bacitracin
- Methylene Disalicylate (BMD)
- Zinc bacitracin
- Lincomycin in combination with tylosin tartrate / phosphate

**Layer Chicken**
- 97% of farms: Oxytetracycline or chlortetracycline or BMD in combination with any one of the anti-mycoplasma drugs
- Tiamulin hydrogen fumarate or tylosin phosphate or tylovalosin tartrate or tilmicosin
Antibiotics in drinking water

Broiler Chicken
- Enroflaxacin or
- Ciprofloxacin or
- Levofloxacin

Layer Chicken
- Enroflaxacin or
- Ciprofloxacin or
- Livofloxacin or
- Sulphathrimethoprim or
- Neomycin or
- Oxytetracycline

All the broiler and layer farms surveyed were using antibiotics as feed additive in some or the other form predisposing to the presence of antibiotic residues in meat or egg (Kavitha, 2021).
Poorly absorbed by the host and thus are non-toxic – eg. Avoparcin & Flavomycin

Do not have a withdrawal period eg. Tylosin & Virginiamycin

Require withdrawal periods eg. Nitrofurans & Quinoxaline-N-oxides.

Improvements of 4–16 percent in growth rate & 2–7 percent FCR.
• Response is greatest in young animals
Gut Health

- The poultry gastrointestinal microbiome regulates the host's growth and health.
- The use of antibiotics promotes drug-resistant pathogens, leading to dysbiosis.
- Non-antibiotic microbial growth promoters enhance performance and meat production.
Alternatives to Antibiotics

- Phytogenics,
- Organic acids,
- Prebiotics,
- Probiotics, and
- Enzymes

**Modes of action** – synbiotic, antagonistic, and synergistic or combative effects between alternatives or other feed nutrients.

- Immuno-modulation,
- Enhance digestion, Improving nutrient availability, increase absorbability of nutrients,
- Antimicrobial, antioxidant activity,
- Enhancement of gut integrity, intestinal barrier function or improve intestinal health, nutrient for the host, and modulating the host gut microflora.
Healthy Microbiome
- Dominant Bacteria
  - Firmicutes (78%)
  - Bacteroidetes (11%)
  - Proteobacteria (4%)

Dysbiotic Microbiome
- Pathogens
  - Campylobacter
  - Salmonella
  - Escherichia

Antimicrobial Growth Promoters
- Restrains the growth of pathogens
- Lowers the incidence of diseases
- Improves productivity

Non-Antibiotics
- Probiotics, prebiotics, phytobiotics, bacteriophages
- Enhances probiotic bacterial density
### 4 Main Types of Phytogenics

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Tannin*</td>
<td>sorghum, gallnut, tree bark</td>
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<tr>
<td>Saponin*</td>
<td>yucca plant</td>
</tr>
<tr>
<td>Essential oil*</td>
<td>oregano, rosemary, etc.</td>
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<tr>
<td>Flavonoid</td>
<td>citrus fruit and/or green tea</td>
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</table>

*Used in poultry*
Saponins and gut health

- Chaudhary (2017) reported that soapnut shell powder saponin @ 75 and 150 ppm had significantly improved both cell mediated and humoral immune response in broiler breeders.

- Saponins can stimulate secretion of cytokines and trigger innate immunity (Song and Hu, 2009).

- Saponins reduces total cholesterol and LDL cholesterol levels in serum and meat.

- Saponin rich feeds: Lucerne meal, tree leaves, soapnut, legumes, green leafy vegetables.
The diagram illustrates the effects of various natural compounds on chicken growth performance. The compounds include black seed, ginger, Atrihis annua, fennel, red pepper, thyme, rosemary, dill, chicory, coriander, licorice, Radix Bupleuri, Moringa oleifera, Curcuma xanthorrhiza, resveratol, cinnamon, and ginkgo biloba.

- **Black seed** and **ginger** increase productivity.
- **Atrhiris annua**, fennel, red pepper, thyme, and rosemary increase villus height of the intestine.
- **Dill**, **chicory**, and **coriander** improve growth performance.
- **Antioxidant activity**
- **Antimicrobial activity**
- **Immunomodulatory activity**
### Table 1. Effect of turmeric on poultry nutrition

<table>
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<tr>
<th>Form of turmeric</th>
<th>Effects of turmeric</th>
<th>References</th>
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<tbody>
<tr>
<td>Turmeric oleoresin</td>
<td>Enhance the growth performance of broilers, resistance against avian necrotic enteritis, reduce the gut lesions</td>
<td>Lee et al. (2013)</td>
</tr>
<tr>
<td>Dietary turmeric powder (7 g/kg)</td>
<td>Improved relative growth rate and body weight, enhanced meat quality, reduced serum concentration of cholesterol and triglycerides</td>
<td>Hussein (2013)</td>
</tr>
<tr>
<td>Dietary turmeric or <em>Curcuma longa</em> turmeric powder</td>
<td>Good egg quality like improved eggshell thickness and hardness but shows decreased yolk cholesterol content</td>
<td>Rahayu et al. (2015)</td>
</tr>
<tr>
<td><em>Curcuma xanthorrhiza</em></td>
<td>Improve meat quality, increase in carcass weight percentage</td>
<td>Rahayu et al. (2015)</td>
</tr>
<tr>
<td>Turmeric rhizome powder</td>
<td>Increase total cholesterol level and hemoglobin, decrease in blood albumin content</td>
<td>Emadi et al. (2007)</td>
</tr>
<tr>
<td>Curcumin</td>
<td>Improved egg quality, anticoccidial effect</td>
<td>Galli et al. (2018)</td>
</tr>
<tr>
<td>Turmeric rhizome extract</td>
<td>Improved antioxidant capability, high growth performance, increased breast muscle weight ratio, reduction in the abdominal fat ratio</td>
<td>Zhang et al. (2015)</td>
</tr>
</tbody>
</table>

The Indian Veterinary Journal (February, 2022)
Essential oils

Aromatic oils used so far in poultry production include oils from

- Turmeric (Curcuma longa),
- Garlic (Allium sativum),
- Oregano (Origanum vulgare),
- Onion (Allium cepa),
- Lemon balm (Melissa officinalis),
- Peppermint (Mentha piperita),
- Rosemary (Rosmarinus officinalis),
- Cinnamon (Cinnamomum zeylanicum),
- Thyme (Thymus vulgaris),
- Ginger (Zingiber officinale),
- Eucalyptus (Eucalyptus), and clove (Syzygium aromaticum)
Effects of Essential Oils in the Avian Gastro Intestinal Tract

- Intestinal villus development ✓
- Mucin production ✓
- Enterocyte migration ×
- Intestinal pH ~×
- Pancreas estimulation ~✓
- Enzymes
Lauric acid and gut health

- Different sources of lauric acid could be considered as a suitable alternative to antibiotic growth promoters in the diet of broiler chicken.