

## The application impact of an organum, anise and citrus oils blend in horses nutrition

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The aim of the paper was to analyse the organum, anise and citrus oils blend as a potential phytogetic feed additive in horse's nutrition. Several studies in the World analyze the effect of plant origin aromatic additives on blood serum indicators and nutrients digestibility in horses. Organum and anise contains many chemical compounds as carvacrol, thymol and anethol, which can be beneficially in metabolism and nutrients digestion. Some studies shows, that these additives have insignificant ( $P > 0.05$ ) effect on blood serum indicators, but there are some studies, which reported positive significant ( $P < 0.05$ ) effect on serum cholesterol and triglycerides contents. The main positive effect of organum and anise is in nutrients digestibility improving. These herbs can improve the digestibility of dry matter, organic matter, nitrogen free extract, crude fibre, ADF and NDF ( $P < 0.05$ ), as well as Mg and K from feed rations ( $P < 0.05$ ). Some antagonistic results published in this area can be affecting in dosage of active compounds, which have often antinutritive effects.

**Keywords:** equine, additives, aromatic plants, feed rations

### 1. Phytogetic additives in horses nutrition

In the last 20 years, there is in the World an increase of horse's nutrition and feeding interest. In modern horses nutrition are very actual feed additives and detection of additives on metabolism and nutrients utilization. Feed additives are use in modern animal nutrition. They are products which are fed separately or as a component in feed mixture for animal performance improving (Gálik, 2012). Feed additives are used in animal nutrition for their positive effect on health status and quality of animal production (Suchý et al., 2002; Straková et al., 2007). Capcarová and Kolesárová (2010) reported that feed additives are products with positive effects on animal performance. A relatively new group of feed additives in the World are phytogetics (Steiner, 2006; Windisch et al., 2008). There are some papers and reports with possible using of phytogetics in horses nutrition, and the effect of phytogetics on horses performance. In recent years, many studies analyse the effect of different feed additives type on horse's performance, mainly on the base of nutrients digestibility (Morgan et al., 2007; Gálik et al., 2012b). The aim of the study was to analyze the effect of a blend of organum, anise and citrus fruits essential oils on biochemical indicators and nutrients digestibility in sport horses nutrition.

**Table 1** Herbs and spices frequently used in phytogetic feed additives

| Herb/Spice     | Scientific name            | Main constituents                 |
|----------------|----------------------------|-----------------------------------|
| Oregano        | <i>Oreganum vulgare</i>    | Carvacrol, thymol                 |
| Thyme          | <i>Thymus vulgare</i>      | Thymol, carvacrol                 |
| Garlic         | <i>Allium sativum</i> L.   | Diallyldisulphide, allin, allicin |
| Horse radish   | <i>Armoracia rusticana</i> | Allyl-isothiocyanate              |
| Chilli, Pepper | <i>Capsicum frutescens</i> | Capsaicin                         |
| Peppermint     | <i>Mentha piperita</i>     | Menthol, carvacrol                |
| Cinnamon       | <i>Cinnamomum cassia</i>   | Cinnamaldehyde                    |
| Anise          | <i>Pimpinella anisum</i>   | Anethol                           |

Source: Steiner, 2006

#### 1.1 The effect of phytoadditives on biochemical indicators

Metabolic profile tests are very good indicators of nutrition level in sport horses nutrition and feeding (Gálik et al., 2012b). The aim of the study of Gálik et al. (2013) was to analyse the effect of phytogetic additive on biochemical indicators and nutrient digestibility.

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Authors used 14 warmblood sport horses (medium exercise) divided into two groups. In experimental group, a blend of essential oils from origanum, anise and citrus fruits was used in feed rations (crimped barley, meadow hay and mineral feed mixture) supplementation. The experiment lasted 90 days, blood collections were at the beginning of experiment, after 60 days and at the end of the experiment before feeding. Phytogenic additive had insignificant effect ( $P > 0.05$ ) on blood serum indicators. A tendency of lower serum triglycerides and higher glucose were found. As well as a tendency of higher AST and ALP enzymes activity was found as an effect of feed rations supplementation with phytogenic additive. The effect of phytogenic additives on biochemical blood serum indicators were reported also by Epp et al. (2005). Authors found positive effect ( $P < 0.05$ ) of additive for lower serum concentrations of cholesterol and triglycerides. In other experiment Pearson et al. (2005) analyzed a blend of origanum, fennel and anise on blood serum indicators of sport horses during the exercise. Authors found insignificant ( $P > 0.05$ ) effect of additive on serum indicators. These results shows, that main factor of phytoadditives effect in animal nutrition and feeding is their dosage and content of chemical substances with possible antinutritive effect as tannins, polyphenols etc. (Suchý et al., 2002).

## 1.2 The effect of phytoadditives on nutrients digestibility

Aromatic herbs and essential oils are often claimed to improve the flavour and palatability of feed, thus increasing voluntary feed intake resulting in improved body weight and nutrients utilization (Zeng et al., 2015). Some studies show significantly effect of phytoadditives on digestion, and in this way positive effect on nutrients utilization and lower feed costs (Fors, 2009). The effect of a blend of origanum, anise, and citrus fruit oils (dried form in 1 g per 1 kg of concentrated feed) were analyzed by Gálik et al. (2013). The experiment lasted 90 days, and during the last week of the experiment apparent digestibility trial were performed. Significantly ( $P < 0.05$ ) higher dry matter and organic matter digestibility and higher crude protein digestibility ( $P > 0.05$ ) in experimental horses were found. Probably, these results were affecting by origanum, which might help in digestion by increasing bile flow (Steiner, 2009). This mixture can improve macroelements utilization in horse's nutrition also (Gálik et al., 2011). Authors analysed the commercial phytogenic additive on macroelements faecal digestibility in sport horses. They found significantly ( $P < 0.05$ ) higher Mg and K digestibility coefficients after additive supplementation, and a tendency ( $P > 0.05$ ) of higher Ca, P and Na faecal digestibility. These results are in confirmation with results

**Table 2** The effect of a blend of origanum, anise and citrus oils on blood serum indicators (mean  $\pm$  S.D.)

|                                  | TRG                  | CHOL            | GLU             | TP                | AST                  | ALT             | ALP             |
|----------------------------------|----------------------|-----------------|-----------------|-------------------|----------------------|-----------------|-----------------|
|                                  | mmol l <sup>-1</sup> |                 |                 | g l <sup>-1</sup> | μkat l <sup>-1</sup> |                 |                 |
| 1 <sup>st</sup> blood collection |                      |                 |                 |                   |                      |                 |                 |
| Control                          | 0.24 $\pm$ 0.04      | 2.25 $\pm$ 0.27 | 6.03 $\pm$ 0.55 | 60.11 $\pm$ 1.48  | 3.72 $\pm$ 0.61      | 0.12 $\pm$ 0.02 | 4.50 $\pm$ 0.49 |
| Experiment                       | 0.19 $\pm$ 0.03      | 2.46 $\pm$ 0.17 | 5.94 $\pm$ 0.48 | 62.24 $\pm$ 4.12  | 3.76 $\pm$ 0.39      | 0.13 $\pm$ 0.01 | 3.69 $\pm$ 0.43 |
| 2 <sup>nd</sup> blood collection |                      |                 |                 |                   |                      |                 |                 |
| Control                          | 0.23 $\pm$ 0.03      | 2.27 $\pm$ 0.38 | 5.73 $\pm$ 0.12 | 68.93 $\pm$ 6.23  | 3.81 $\pm$ 0.20      | 0.12 $\pm$ 0.01 | 3.27 $\pm$ 0.53 |
| Experiment                       | 0.07 $\pm$ 0.01      | 2.18 $\pm$ 0.24 | 5.90 $\pm$ 0.21 | 68.48 $\pm$ 1.50  | 3.93 $\pm$ 0.20      | 0.13 $\pm$ 0.02 | 3.14 $\pm$ 0.46 |
| 3 <sup>rd</sup> blood collection |                      |                 |                 |                   |                      |                 |                 |
| Control                          | 0.31 $\pm$ 0.03      | 2.18 $\pm$ 0.29 | 5.33 $\pm$ 0.15 | 60.55 $\pm$ 3.62  | 3.49 $\pm$ 0.39      | 0.13 $\pm$ 0.10 | 4.07 $\pm$ 0.51 |
| Experiment                       | 0.30 $\pm$ 0.04      | 2.34 $\pm$ 0.36 | 5.94 $\pm$ 0.42 | 62.79 $\pm$ 4.18  | 3.76 $\pm$ 0.20      | 0.16 $\pm$ 0.01 | 3.52 $\pm$ 0.61 |

Source: Gálik et al., 2013

TRG – triglycerides, CHOL – cholesterol, GLU – glucose, TP – total protein, AST – aspartat transaminase, ALT – alanine transaminase, ALP – alkaline phosphatase, S.D. – standard deviation

**Table 3** The effect of a blend of origanum, anise and citrus oils on organic nutrients digestibility (mean  $\pm$  S.D.)

|            | DM                              | OM                            | CP               | NFE                           | CF                            | ADF                           | NDF                           |
|------------|---------------------------------|-------------------------------|------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
|            | digestibility coefficients in % |                               |                  |                               |                               |                               |                               |
| Control    | 56.87 <sup>a</sup> $\pm$ 4.35   | 68.32 <sup>b</sup> $\pm$ 3.19 | 71.36 $\pm$ 4.49 | 76.07 <sup>c</sup> $\pm$ 2.50 | 47.29 <sup>d</sup> $\pm$ 2.30 | 31.90 <sup>e</sup> $\pm$ 4.28 | 42.41 <sup>f</sup> $\pm$ 4.01 |
| Experiment | 62.98 <sup>a</sup> $\pm$ 4.64   | 73.31 <sup>b</sup> $\pm$ 2.26 | 72.86 $\pm$ 4.96 | 80.08 <sup>c</sup> $\pm$ 2.35 | 51.61 <sup>d</sup> $\pm$ 4.15 | 37.45 <sup>e</sup> $\pm$ 5.81 | 47.35 <sup>f</sup> $\pm$ 4.26 |

DM – dry matter, OM – organic matter, CP – crude protein, NFE – nitrogen free extract, CF – crude fibre, ADF – acid detergent fibre, NDF – neutral detergent fibre, S.D. – standard deviation

Values with identical superscript in the column are significant different et the level  $P < 0,05$

of Turner et al. (2006) who detected, that phytoadditives such as anise or bee pollen can significantly increase feed intake and subsequently increased the nutrients retention. A blend of origanum, anise and citrus fruits essential oils were analyzed in saccharides digestibility point of view also. Gálik et al. (2012a) reported, that feed ration supplementation by 1 g per 1g of concentrated feed can positively affect nitrogen free extract, crude fibre, ADF and NDF faecal digestibility ( $P < 0.05$ ). Kamel (2000) reported that one of the main phytoadditive in feed rations of animals is origanum (*Oreganum vulgare*) with active compounds carvacrol and thymol or anise (*Pimpinella anisum*). Positive effects of phytogenic additives are determined by application dosage and additive composition; however, origanum might help digestion by increasing bile flow and fighting against some bacteria, viruses, fungi, intestinal worms and other parasites (Steiner, 2009).

## 2. Conclusions

The aim of the study was to analyze the effect of a blend of origanum, anise and citrus fruits essential oils on biochemical indicators and nutrients digestibility in sport horses nutrition. The mixture of origanum, anise and citrus oils can significantly affect some biochemical indicators as cholesterol and triglycerides. However, this additive has significant effect on dry matter and organic matter digestibility ( $P < 0.05$ ) as well as in Mg and K apparent digestibility ( $P < 0.05$ ). Results with phytogenic additive with active origanum, anise and citrus fruits show, that this additive is useful in sport horses nutrition.

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