Producers can benefit from essential oils in pig finishing diets

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Essential oils have multiple desirable properties which can have beneficial effects on animal performance, such as finishing pigs, when added to their rations.

The purpose of this article is to briefly describe essential oils, some of their properties and present evidence that they can positively affect weight gain and feed efficiency.

Phytogenics

Phytogenic feed additives are herbal preparations from plants which have beneficial properties beyond their organoleptic and olfactory properties. Plants containing these substances have a long tradition in human diets where they have been used for centuries as culinary spices as well as for aiding digestion and stabilising health.

Phytogenic substances used in animal nutrition can be categorised as follows:

- Processed aromatic plants (for example, herbs, spices).
- Parts of plants (leafs, seeds, fruits, roots).
- Extracts made of plants or plant parts.

Today, essential oils are gaining prominence as animal feed additives.

What are essential oils?

Essential oils are generally understood to be liquid preparations from aromatic plants that have notable beneficial effects on maintaining animal performance. The oils are the substances responsible for the fragrance and plants may contain 0.01-2% essential oils. The oils tend to accumulate in specialised parts of the plants, for example leaves (eucalyptus, cinnamon leaf oil, patchouli), bark (cinnamon), seeds (caraway, anis, pepper), bulbs (garlic), roots (ginger, vetiver) or in fruit peels (lemon, orange). Although essential oils are not thought to be vital to the plant's existence, there is much speculation about their role and advantages the plants gain from their production:

- Attractant for pollinating insects.
- Protection against herbivores.
- Protection against bacteria and fungi.

Composition

The composition of essential oils is very complex as most essential oils contain hundreds of substances, some of which are present in higher concentrations than others.

Some of these substances have been shown to exert different biological activities, such as antimicrobial, antiviral or antioxidant. Table 1 gives some examples of a number of different substances with different activities found in different herbs and spices.

Feed additives

Plants expressing essential oils contain the active components in extractable concentrations. The standard method of extracting essential oils is by steam distillation; thus, their inclusion level in feed is low (<0.01%) relative to using whole plants or plant parts, which would require much higher levels (>5%) to achieve the same effects.

Furthermore, the composition of essential oils is influenced by cultivar within plant variety, climatic conditions and time of harvest.

Blending oils from different batches of plants is a practical method to compensate for the different concentrations between batches and assure oil with a standardised composition and quality, which is prerequisite for consistent efficacy.

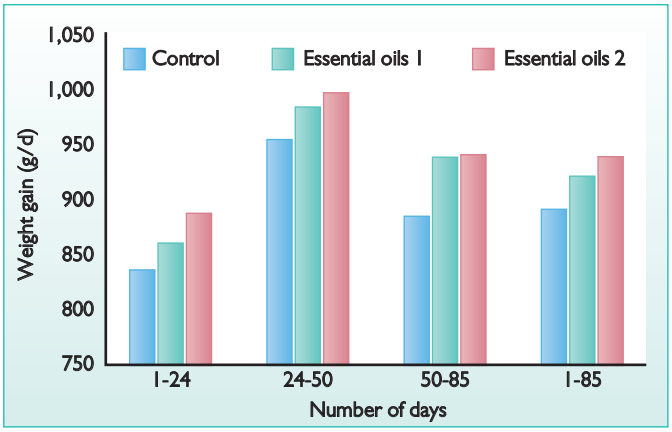

Fig. 1. Impact of phytogenic substances on daily gain of finishing pigs (adapted from Korniewicz et al., 2007).

Improved pig performance

Essential oils can be used effectively in finishing pig diets due to their sensory properties and biological activities. This is demonstrated in a trial where grower-finisher pigs were fed diets supplemented with essential oils at dosages of either 125 or 500g/ton.

Pigs fed diets containing the essential oils had improved weight gain (Fig. 1) and feed conversion (Fig. 3), while feed consumption was not affected compared to performance of pigs fed unsupplemented diets (see Fig. 2).

Combination of oils

Pigs have a sophisticated sense of taste and smell; therefore, particular attention must be paid to the palatability of feed, particularly at times of feed change where changes to strong or unpleasant tasting or smelling feeds should be avoided.

Better feed acceptability can be achieved through suitable combinations of essential oils by, for example, covering bitter tasting substances with sweet-fruity aromas. Basically, essential oil products should contain a mixture of components which are effective in the gastro-intestinal tract, and have

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Table 1. Types and number of biologically active compounds found in different plant species (adapted from Máthé, 2009).

	Antioxidative[1]	Sedative	Antidepressant	Antiviral	Antimicrobial
Bay	3	5	-	5	5
Cassia	3	-	-	3	3
Cayenne	9	7	7	6	8
Cumin	5	6	-	7	11
Garlic	9	5	5	5	13
Ginger	6	11	5	6	17
Oregano	14	-	-	11	19
Rosemary	12	6	-	10	19
Sage	7	-	-	-	6
Thyme	4	-	3	3	5

[1]Antioxidative substances can delay oxidation of feed ingredients (fats, oils), hence preventing degradation and increasing shelf life.

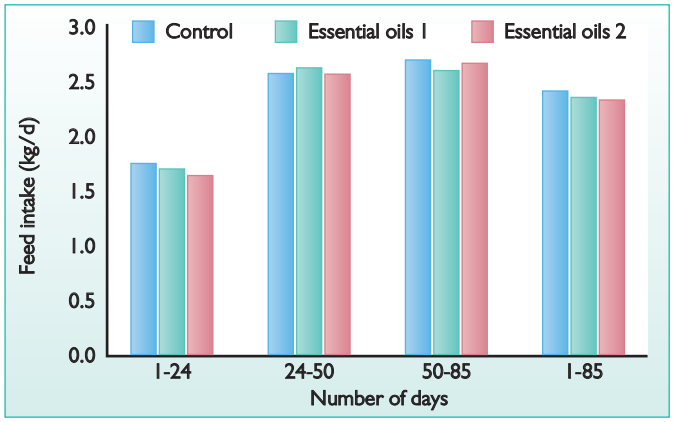

Fig. 2. Impact of phytogenic substances on daily feed intake of finishing pigs (adapted from Korniewicz et al., 2007).

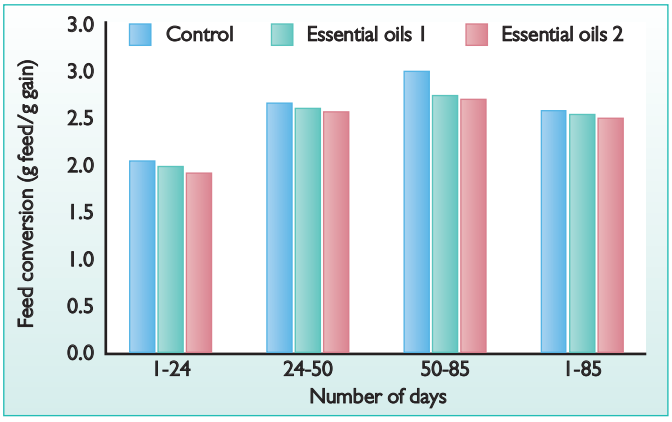

Fig. 3. Impact of phytogenic substances on feed conversion (feed/gain) of finishing pigs (adapted from Korniewicz et al., 2007).

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appropriate sensory properties.

The earlier animals are fed diets with phytogenic substances, as a general rule, the better the effects expected.

Application in practice

Single essential oils and mixtures of essential oil are used in pig finishing diets. Oregano, thyme, clove, and garlic oil or their primary active components are often used in these preparations. Usually essential oils are mixed into the compound feed directly in the feed mill or via a premix at the farm. Thus, precise mixing equipment is needed for good distribution of the essential oils in the diet since inclusion rates are relatively small.

Essential oils can exert beneficial effects on digestion, particularly in times of enhanced stress. Feed change is such a stress factor, which often results in a decrease of feed consumption and occasional intestinal disorders. In these conditions, essential oils can have a stabilising effect, hence maintaining feed consumption and preventing digestive dysfunctions.

Feed conversion is usually affected more adversely than feed intake.

Improved daily gain

Increased protein digestibility and improved feed conversion was shown in trials with weaning piglets fed a blended (oregano, anise and citrus oil) essential oil product.

Application of this blend of essential oils in pig diets resulted in an improvement of daily gain and feed conversion ratio by 6.5 and 6.1%, respectively. Additionally, lower NH4+ concentrations were determined in the slurry of these pigs, indicating better protein utilisation and subsequent reduced ammonia emissions, thus having a beneficial effect towards the environment.

In conclusion, phytogenic substances have characteristic tastes and aromas and can exert multiple effects in the digestive tract. Their effects include stabilisation of proper digestion and improvements in finishing pig performance. Phytogenic feed additives with standardised essential component composition are necessary to achieve expected and appropriate effects on feed palatability and performance of pigs. ■