

Review

Greek experience of the use of phytogenic feed additives in organic pig farming

V. G. Papatsiros^{1*}, E. D. Tzika², P. D. Tassis², D. Kantas³, L. C. Filippopoulos⁴ and D. S. Papaioannou⁵

¹Clinic of Medicine, Faculty of Veterinary Medicine, University of Thessaly, 43100, Karditsa, Greece.

²Farm Animal Clinic, School of Veterinary Medicine, Aristotle University of Thessaloniki, Greece.

³Department of Animal Production, Technological Educational Institute of Larissa, Greece.

⁴Research Associate Technical Manager, PROVET, Vrago, Aspropyrgos, Attica Greece.

⁵Department of Obstetrics and Reproduction, Faculty of Veterinary Science, University of Thessaly, Greece.

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The purpose of this study is to present brief updating information about the use of phytogenic feed additives in Greek organic pig farming. Organic pig production systems in Greece are growing in popularity over the last years due to the increasing interest of consumers for organic products. The National Greek projects of organic pig farming started in 2002 and since then it has increased, representing the 15% of the total organic livestock production. Phytogenic feed additives are plant-derived products used in animal feeding to improve the performance of agricultural livestock. This class of feed additives has recently gained increasing interest, especially for use in pigs. During the last few years the number of Greek pig organic farmers who use phytogenic feed additives as potential alternatives to antibiotics for prevention and control enteric diseases and as growth promoters, is increased.

Key words: Organic farming, pig, phytogenic feed additives, Greece.

INTRODUCTION

In view of organic livestock farming, Greece has many advantages in comparison to the other European countries, the temperate climate and the wide and rich ecosystems in countryside. For thousands of years, outdoor pig farming has been one of the most important livestock production sectors in Greece. Since the 60s, the introduction of high-yielding pig genotypes, under intensive production systems, has replaced almost to disappearance the traditional outdoor pig farms, which were based on the native pig breed. The practice of organic pig production systems in Greece is growing in popularity over the last years due to the increasing interest of consumers for products considered as

traditional. The National Greek projects of organic pig farming started in 2002 and since then it has increased, representing the 15% of the total organic livestock production. Based on the data of Greek Ministry of Rural Development and Foods, in 2002 the population of organic pigs was just 1,288, but in 2006 to 2007 it increased to a 175.000 (DOA, 2009).

The most common health problems that occur in the Greek organic pig farming due to the different management strategies from conventional production in terms of, for example, feeding, access to outdoor areas, weaning age and no use of preventive medication with antibiotics (Papatsiros, 2011). Majority of them include mainly piglet mortality, parasitic infections, as well as respiratory, gastrointestinal and skin problems. Causes of high piglet mortality are mainly various diarrhoea syndromes in suckling and weaning piglets and skin

*Corresponding author. E-mail: vpapatsiros@vet.uth.gr.

traumas or crushing of piglets by sows. *Escherichia coli*, *Clostridium peifringens* and parasites are involved in the risk factors of diarrhoea in weaned pigs. Common are also respiratory problems (mainly due to *Mycoplasma Hyopneumoniae*, *Actinobacillus pleuropneumoniae* and Porcine Reproductive and Respiratory Syndrome Virus), with usually sign in growing and finishing pigs (Papatsiros, 2011).

Phytogenic feed additives (often also called phytobiotics or botanicals) are commonly defined as plant-derived compounds incorporated into diets to improve the productivity of livestock through amelioration of feed properties, promotion of the animals' production performance and improving the quality of food derived from those animals (Windisch et al., 2008). Phytogenic feed additives include herbs, which are non-woody flowering plants known to have medicinal properties such as; herbs (flowering, non-woody, and non-persistent plants), spices (herbs with an intensive smell or taste commonly added to human food), essential oils (aromatic oily liquids derived from plant materials such as flowers, leaves, fruits and roots), or oleoresins (extracts derived by non-aqueous solvents from plant material) (Windisch et al., 2008; Jacela et al., 2010). Two of the most common phytogenic substances evaluated in swine include the spices oregano and thyme (Tsinas et al., 1998; Jugl-Chizzola et al., 2005; Hagmuller et al., 2006; Neill et al., 2006; Windisch et al., 2008; Papatsiros et al., 2009). The aim of this study is to present, for the first time, brief updating information about the use of phytogenic feed additives in Greek organic pig farming. Furthermore, it focuses on their beneficial effects on prophylaxis of swine diseases as well as on growth performance.

PHYTOGENIC FEED ADDITIVES: BENEFICIAL EFFECTS ON SWINE

The mode of action of most phytogenic feed additives is still not fully understood, but antimicrobial, antioxidative, and growth-promoting effects in swine have already been reported (Windisch et al., 2008; Jacela et al., 2010). The most well known potential mechanisms of their action are as follows:

Antimicrobial effects

Oregano and thyme are among those which have received a great deal of interest (Tsinas et al., 1998; Hagmuller et al., 2006; Neill et al., 2006; Windisch et al., 2008; Papatsiros et al., 2009). These plants contain the monoterpenes carvacrol and thymol, respectively, and have demonstrated high efficacy *in vitro* against several pathogens found in the intestinal tract (Baratta et al., 1998; Burt, 2004; Namkung et al., 2004; Jugl-Chizzola et

al., 2005).

Antioxidative effects

phytogenic feed additives derived from plants high in terpenes (such as rosemary, oregano and thyme) have anti-oxidative properties, mainly due to their phenolic terpenes (Aeschbach et al., 1994; Jimenez-Alvarez et al., 2008; Windisch et al., 2008; Frankic et al., 2009). In addition, phytogenic feed additives derived from the Labiatae plant family containing herbal phenolic compounds to improve the oxidative stability of pork meat (Janz et al., 2007).

Growth-promoting effects

Growth-promoting effects (increased feed intake, improved gut function and dietary palatability): their stimulatory effect on feed intake is probably due to the improvement in the dietary palatability of resulting from the enhanced flavor and odor, especially with the use of essential oils (Kroismayr et al., 2007; Frankic et al., 2009). Recent studies indicated, also stabilizing effects of phytogenic feed additives (essential oils and oleoresins) on the ecosystem and the activity of gastrointestinal microbial flora of swine (Manzanilla et al., 2004; Namkung et al., 2004; Castillo et al., 2006; Kroismayr et al., 2007) associated with a decrease in microbial activity in the gastrointestinal gut. Improvement in gut function is mainly attributed to the possible stimulatory effect of phytogenic substances on digestive secretions, such as digestive enzymes, bile, and mucus (Platel and Srinivasan, 2004).

USE OF PHYTOGENIC FEED ADDITIVES IN GREEK ORGANIC PIG FARMING

Disease prevalence and veterinary treatments in organic animal production differ from conventional systems. Since the use of antibiotics and antiparasitic drugs is undesirable in organic pig production, the main focus is on prevention of diseases and parasites and applying appropriate feeding and housing standards (European Commission, 2004). Therefore, among the alternatives to chemically synthesized allopathic veterinary medical products, plant extracts and essential oils also called phytogenics, have received greater attention in recent years. During the last few years the number of Greek pig organic farmers using phytogenic feed additives as potential alternatives to antibiotics is increased. Based on our experience, we support that the use of the above products can have significant antimicrobial activity against bacteria (especially Gram, mainly *Escherichia coli*), antioxidative action, as well as enhance dietary

palatability, improve the gut functions and promote growth performance and carcass quality of pigs (Papatsiros et al., 2009; Tzika et al., 2010a,b,c; Kantas et al., 2011).

For example, the results of our field trial study, with the use of flavouring material containing plant extracts of *Origanum vulgare* and *Allium sativum* in the diet of weaning and growing pigs, indicated reduction of prevalence of *Lawsonia intracellularis* in the intestine and the diarrhoea score (DS), as well as improvement of growth performance and carcass quality (increased body weight and average daily gain) (Papatsiros et al., 2009). In a previous study, the use of a natural, plant-derived feed additive in the feed at inclusion rate of 50 ppm, had considerable beneficial effects on growth performance of weaned piglets, including a significant increase in body weight of piglets and the average daily gain as well as a reduction in feed conversion ratio (Kantas et al., 2011). In addition, possible anti-inflammatory activity of larch sawdust, echinacea, pumpkin, salix, sinupret and grape seed, in order to reduce incidence of post-partum dysgalactia syndrome, were investigated (Tzika et al., 2010a, b, c).

The in-feed use of larch did not show a clear positive antimicrobial effect against *L. intracellularis* infection in growing pigs, although the 3rd group (adding larch in 2.5%) had less positive blood samples from pigs at 14th week of age relatively to the control group. However, for the overall trial period, productivity parameters and DS of larch-fed pigs were improved relatively to the negative controls (Tzika et al., 2010a). Moreover, the results of the trial showed that pumpkin at 1 and 2.5% inclusion rates did not show a clear positive antimicrobial effect against *E. coli* infection in weaners (Tzika et al., 2010b). Finally, the use of larch sawdust in the diet of sows results showed that sows fed with had an improvement tendency in performance and health parameters (for example, average litter body weight, post partum temperatures) compared to the control group. Additionally, there was a significant decrease of serum IL6 and plasma Tumor Necrosis Factor-alpha (TNF α) concentrations at 24 and 72 h PP, probably due to larch sawdust anti-inflammatory activity (Tzika et al., 2010c).

CONCLUSIONS AND FUTURE DIRECTIONS

The rapid growth of the popularity of organic farming can also be considered a major driving factor for the increased necessity of alternative control measures. In recent years, phyto-genic feed additives have attracted increasing interest as an alternative feeding strategy to replace antibiotic growth promoters. This has occurred especially in the European Union, where antibiotics have been banned completely from use as additives in livestock feed since 2006, because of a suspected risk of generating microbial flora with increased resistance to

the antibiotics used for therapy in humans and animals. The organic pig farming is a new interesting market for phyto-genic feed additives around the world and in Greece, as these products could be used as alternatives to antibiotics for prevention and control of enteric diseases, as well as growth promoters.

The phyto-genic feed additives market will certainly continue growing in the next years but in our view, special attention needs to be paid to the following aspects:

- (A) Focusing on well-designed clinical field trials to prove the safety and efficacy of phyto-genic feed additives, in parallel to a cost-benefit evaluation. However, over the last decade, the global interest in organic livestock farming and phyto-genic agents has attracted the attention of many pharmaceutical companies, and it is estimated that their efficacy and safety will be proved and improved in the near future.
- (B) Promoting the use of phyto-genic feed additives in organic pig farming, as it agrees with today consumer demands for more environmental friendly pig production, supporting at the same time farmers needs for increased and cost effective production.

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