KRMIVA

FORMI - THE FIRST APPROVED ALTERNATIVE TO FEED ANTIBIOTICS

FORMI - PRVA ODOBRENA ALTERNATIVA KRMNIM ANTIBIOTICIMA

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SUMMARY

The European Union (EU) has approved Formi, a non-antibiotic performance enhancer, for use in pig feeds - the first product to receive such an approval. Formal approval was granted on July 02 under the Commission Regulation (EC) No 1334/2001.

Formi (potassium diformate), developed and patented by Norsk Hydro ASA and marketed by BASF AG, has been extensively documented at well-recognized research institutes throughout Europe. The documentation includes effect on growth performance, nutrient utilization, antimicrobial effect, immunology, animal safety, consumer safety and environmental impacts. It is now accepted by the EU (the official report by SCAN) as a safe product for the consumer and the target animal as well as for the environment.

As a dry crystalline powder, Formi is odorless, low-corrosive and easy to handle. It provides a safer work environment compared to liquid forms of organic acids.

The aim of this article is to focus on the performance enhancing effect and the mode of action of Formi, which can be summarized as:

Formi improves weight gain of piglets by an average of 11% and feed efficiency by an average of 6% (Overland et al., 2000), which equals the effect commonly obtained with feed antibiotics.

The major mode of action of Formi is the antimicrobial effect, which reduces the general bacterial population in the gut, especially harmful bacteria such as E. coli and Salmonella, and promotes a more favorable microflora in the gut.

This improves the animal's growth performance and health status, while at the same time ensuring safer products for the consumer.

TRIALS WITH FORMI

Many trials (23) show that pigs fed Formi® perform better than pigs fed regular diets (up to 20%) and equal to pigs fed diets containing antibiotic growth promoters (Overland et al., 2000). This is illustrated here by two trials and the average effect from five dose response trials

- Trial 1 was performed under typical climatic conditions in Scandinavia (Denmark).
- Trial 2 was performed under warm conditions in Spain using conventional piglet diets as basal feeds.
- Average effect from five dose response trials.

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Table 1. Effect of Formi and Tylosin phosphate on Performance of piglets (9 - 21 kg live weight; 120 piglets). Source: Danielsen, 1998

Tablica 1. Djelovanje Formija i tilozin fosfata na rezultate praščića (9 - 21 kg žive vage; 120 praščića). Izvor: Danielsen,1998.

Treatment - Tretman	Control Kontrola	0.6% Formi	1.2% Formi	1.8% Formi	40 ppm Tylosin
Feed intake - Unos hrane (g/d)	554^{a}	593^{ab}	600^{ab}	646^{bc}	629^{b}
Weight gain - Prirast težine (g/d)	355^{a}	418^{b}	437^{bc}	471^{cd}	471^{cd}
Feed: Gain - Hrana: prirast (g/g)	1.56^{a}	1.42^{b}	1.37^{b}	1.37^{b}	1.34^{b}

^{a,b,c,d} Treatment means within the same row, without common superscript differ significantly (P<0.05)

^{a,b,c,d} Načini tretmana u istom redu, bez broja iznad značajno se razlikuju (P<0.05)

In the Danish trial (table 1) the growth rate and feed conversion rate were improved by 32.7 and 12.2%, respectively, with 1.8% Formi. This improvement was similar to using 40 ppm Tylosin phosphate.

Table 2. Effect of Formi and Avilamycin on Performance of piglets. (6.5 - 21 kg live weight; 249 piglets). Source: Daza et al., 2000

Tablica 2. Djelovanje Formija i avilamicina na rezultate praščića (6.5 - 21 kg žive vage; 249 praščića / Izvor: Daza i sur., 2000.

Treatment - Tretman	Control Kontrola	40 ppm Avilamycin 40 ppm Avilamicina	1.2% Formi®
Feed intake - Unos hrane (g/d)	524	532	529
Weight gain - Prirast težine (g/d)	383^{a}	421^{b}	416^{b}
Feed: Gain - Hrana: prirast (g/g)	1.37^{a}	1.26^{b}	1.27^{b}
Health status - Zdravstveno stanje			
No. of days of diarrhoea - Broj dana proljeva	63^{a}	14^{b}	22^{c}
No. of piglets with diarrhoea - Broj praščića s proljevom	10a^{a}	2^{b}	4^{b}

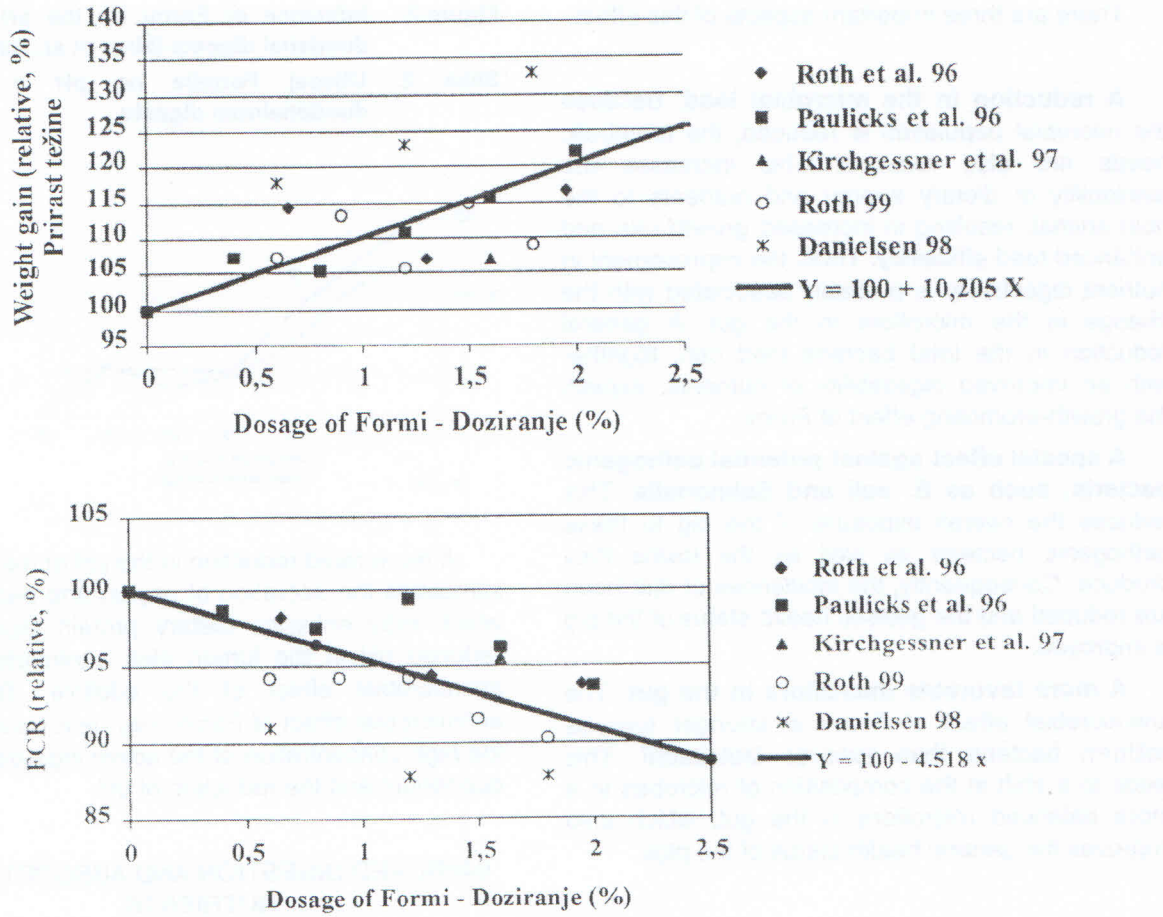
a,b,c Treatment means within the same row, without common superscript differ significantly (P<0.05)

^{a,b,c} Načini tretmana u istom redu, bez broja iznad značajno se razlikuju (P<0.05)

In the Spanish trial (table 2), the growth rate was improved by 8.6% and feed efficiency by 7.3% with the addition of 1.2% Formi in the diets. There were no significant differences between Avilamycin and Formi. Formi also had a significant positive effect on health status of piglets. These trials demonstrate that Formi can replace feed antibiotics.

Average effect from five dose response trials

The performance data from five independent dose response trials, where Formi was tested in feed for piglets against control feed, were used to make an average linear regression line to show the effect of increasing doses of Formi on weight gain (WG) and feed efficiency (FCR).



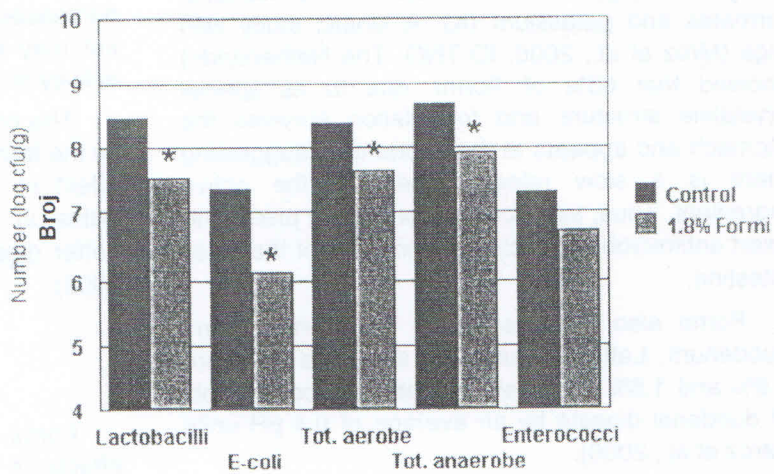
From the regression, it can be concluded that with the addition of 1% Formi to the feed the average weight gain will be improved by 10.2% and feed conversion ratio by 4.5%. High variability was observed between the trials.

ANTIBACTERIAL EFFECT

The antimicrobial effect is regarded as one of the mode of actions of Formi. A study by Hebeler et al. (2000) illustrates this effect (Figure 1).

Figure 1. The antimicrobial effect of Formi in piglets one week after weaning (Hebeler, 2000).

Slika 1. Antimikrobsko djelovanje Formija u praščića jedan tjedan nakon odbića



There are three important aspects of this effect:

A reduction in the microbial load. Because the microbial population is reduced, the metabolic needs are also reduced. This increases the availability of dietary energy and nutrients to the host animal, resulting in increased growth rate and enhanced feed efficiency. Thus, the improvement in nutrient digestibility is probably associated with the change in the microflora in the gut. A general reduction in the total bacteria load can, together with an improved digestibility of nutrients, explain the growth-promoting effect of Formi.

A special effect against potential pathogenic bacteria, such as E. coli and Salmonella. This reduces the overall exposure of the pig to these pathogenic bacteria as well as the toxins they produce. Consequently, the incidences of diarrhoea are reduced and the general health status of the pig is improved.

A more favorable microflora in the gut. The antimicrobial effect of Formi is stronger towards coliform bacteria than towards lactobacilli. This leads to a shift in the composition of microbes to a more balanced microflora in the gut, which also improves the general health status of the pigs.

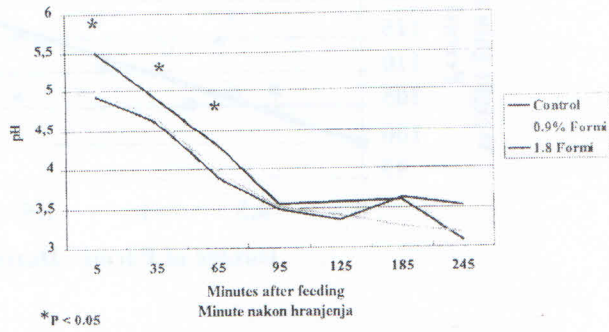
CHEMICAL PROPERTIES IN THE GUT

The active ingredient in Formi is potassium diformate. When diluted in aqueous media such as the gut of a pig, Formi dissociates into formic acid, formates and potassium (K). A kinetic study with pigs (Mroz et al., 2000, ID-TNO, The Netherlands) showed that 85% of Formi, due to its special crystaline structure and formulation survives the stomach and appears in the duodenum, suggesting there is a slow release effect of the active ingredient. Thus, significant amounts are present to exert antimicrobial effect in the first part of the small intestine.

Formi also reduces pH in the stomach and duodenum. Latter is illustrated in Figure 2, where 0.9% and 1.8% Formi significantly reduced the pH of duodenal digesta by an average of 0.4 pH units (Mroz et al., 2000).

Figure 2. Influence of Formi on the pH in fresh duodenal digesta (Mroz et al., 2000)

Slika 2. Utjecaj Formija na pH u svježem duodenalnom digestu



A more rapid reduction in the pH of the stomach stimulates the secretion of pepsin and pepsinogen, which may enhance dietary protein digestion. A reduced pH in the lumen also contributes to the antimicrobial effect of the additive. Thus, the antimicrobial effect of Formi may be a result of both the high concentration of the active ingredient in the duodenum and the reduction of pH.

IMPROVED DIGESTION AND ABSORPTION OF NUTRIENTS

Adding Formi to diets improves digestibility and retention of several nutrients including dry matter, energy, fat, nitrogen (N), several essential amino acids, and phosphorous (P) (Roth et al., 1998a,b). The improvement in nutrient utilization is due to decreased competition from microflora for nutrients, but may also result from improved secretion and activity of digestive enzymes.

The combined effect of increased N-digestibility by the formate fraction in the lumen and the sparing effect of the additional K provided by Formi on lysine in the intermediate metabolism results in better digestibility and retention of N (Mroz et al., 2002).

CONCLUSION

Formi with its growth and health enhancing effects is the ideal alternative to feed antibiotic.

Formi improves animal health, is easy to administer and delivers safe food products to the consumer.

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SAŽETAK

Europska Unija (EU) je odobrila Formi, neantibiotski pospješivač rezultata za primjenu u krmivima za svinje - prvi proizvod koji je dobio takvo odobrenje. Službeno odobrenje izdano je 2. srpnja pod brojem 1534/2001. prema pravilniku Komisije.