Potentiating the beneficial effects of plant extracts in weaned piglets

Weaning is a challenging and stressful phase for piglets, where they face major dietary, environmental and social changes. Piglets become more prone to enteric diseases, such as post-weaning diarrhoea. The economic impact for the pig livestock industry is considerable worldwide, due to the mortality rate, lower performance and antimicrobial medication costs.

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Post-weaning diarrhoea is often associated with the proliferation of bacterial pathogen Enterotoxigenic Escherichia coli. Specific serotypes (F4+/F18+) of this highly virulent pathogen can colonise the intestine of susceptible piglets and liberate their toxins, which can lead to dehydration and diarrhoea.

Moreover, bacterial resistance to commonly used antibiotics has now reached an alarming level. The pig sector could limit the spread of antimicrobial resistance by relying more on natural alternatives which have recently gained more attention.

Silvafeed Nutri P is a standardised blend of plant extracts obtained from sustainable natural resources, for example wood from chestnut (Castanea sativa) and quebracho (Schinopsis spp.). It is rich in bioactive polyphenols and tannins, well known for

their multiple biological properties: antispasmodic; antibacterial; antioxidant; anti-inflammatory.

Dietary supplementation with Silvafeed Nutri P in piglets can modulate gut motility, maintain healthy intestinal microbiota, and protect gut barrier integrity. Overall, supplemented piglets typically show optimal faecal consistency and performance.

The antibacterial properties of Silvafeed Nutri P are indeed numerous and stimulate a great interest. It gives a complex picture of bacteriostatic and bactericidal effects: affecting bacterial cell wall integrity, bacterial metabolism, bacterial adherence and toxin activities.

Owing to the complexity and diversity of plant bioactives found in Silvafeed Nutri P, it is noteworthy that pathogenic bacteria incubated with Silvafeed Nutri P do not select for resistance over time.

Recent research work conducted by the University of Milano and the University of Piacenza within the framework of the Foodtech Project (co-funded by the European Regional Development Fund – ERDF) shed new light on why combining plant extracts can be successful in the case of Silvafeed Nutri P.

Plant extract synergies in reducing in vitro growth of E. coli

Silvafeed Nutri P reduced the in vitro growth of E. coli (F4+) by 50-70% within 2-6 hours of incubation (Fig. 1). The inhibitory effects of Silvafeed Nutri P were much greater and consistent than plant extracts based on a single botanical source, which showed a moderate reduction after six hours (16-38%).

The possible synergies between plant extracts of Silvafeed Nutri P for antibacterial activity were also confirmed after 24 hours of incubation and with other E. coli strains (F18+) obtained from piglets with post-weaning diarrhoea.

In fact, minimal inhibitory concentrations and minimal bactericidal concentrations were notably lower for the blend compared with single plant extracts. Such in vitro results are very promising, but what do we know about a possible antimicrobial effect in vivo?

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Fig. 1. In vitro growth of E. coli (F4+).

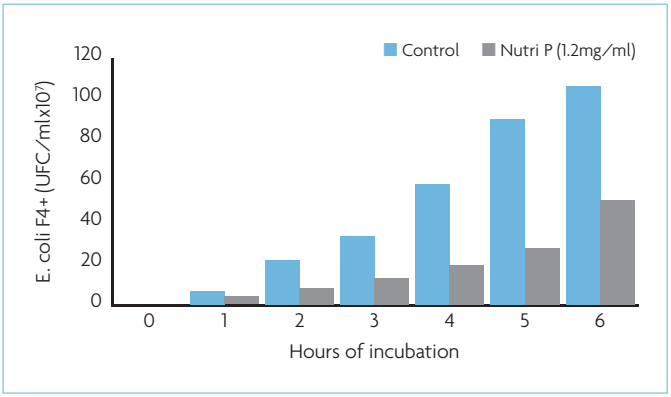
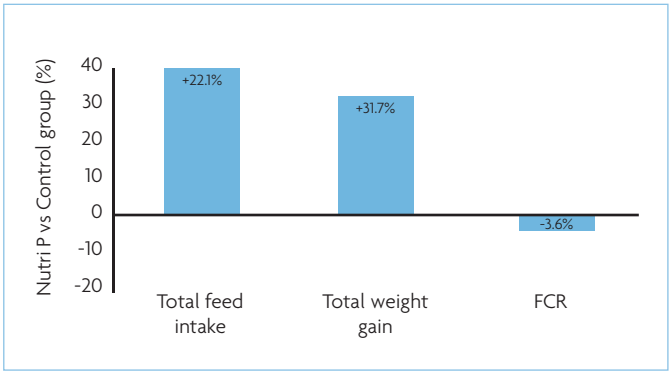


Fig 2. Evaluation of piglet performance after 42 days (average difference between Control and Nutri P group).



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To answer this, plant extracts were subjected to in vitro digestion (including oral, gastric and intestinal phases) before assessing antimicrobial activity.

The blend of plant extracts sustained a significant inhibitory effect against E. coli even after such simulated digestion. In comparison, chestnut extract alone did not show any reduction.

Performance and faecal score of weaned piglets

Based on the preliminary in vitro results, Silvafeed Nutri P was logically chosen for further in vivo evaluation, conducted in collaboration with ProPhos Chemicals (coordinator Marco Michelotti) and Ferraroni Spa for the supply of feed.

108 piglets (Large White × Landrace) weaned after 30 days were divided into four homogenous pens, which received a basal diet (Control group) or a supplemented diet (Silvafeed Nutri P).

After 42 days on experimental diets, the piglets supplemented with Silvafeed Nutri P showed greater feed intake (measured per pen) and a significant improvement in weight gain (+31.7%), resulting in a better feed efficiency (-3.6% for feed conversion rate) (Fig. 2).

Moreover, average daily weight gain of piglets was constantly higher in the Silvafeed Nutri P group, but only reached significance during days 29-42.

Overall, the piglets supplemented with Silvafeed Nutri P were significantly heavier (+2.8kg on average) than the piglets in the Control group.

In addition, faecal consistency and faecal colour were assessed throughout the experiment (Table 1). Piglets supplemented with Silvafeed Nutri P showed optimal faecal consistency and normal brownish faecal colour during the 42-day evaluation post weaning.

In comparison, piglets from the Control group showed sign of mild diarrhoea and yellow-green faecal colour after 42 days.

Faecal consistency (mean scores)	Day 14	Day 28	Day 42
Control group	<1 (normal)	<1 (normal)	2 (diarrhoetic)
Silvafeed Nutri P group	0 (normal)	<1 (normal)	<1 (normal)
Faecal colour (mean scores)			
Control group	>1.5 (brown-green)	>1.5 (brown-green)	<1 (brown-green)
Silvafeed Nutri P group	≈2 (brown)	≈2 (brown)	<1.5 (brown-green)

Table 1. Mean scores for faecal consistency and faecal colour of piglets. Differences between the mean scores of Silvafeed and Control groups were statistically significant on day 42. Faecal consistency score: 0 = normal, 1 = soft consistency, 2 = mild diarrhoea, 3 = severe diarrhoea. Faecal colour score: 0 = yellow, 1 = green, 2 = brown.

Conclusions

Overall, Silvafeed Nutri P is a blend of bioactive plant extracts acting in synergy to support a healthy gut in piglets. The beneficial effects were confirmed by maintaining optimal faecal scores and boosting the performance in piglets during the post-weaning period. The use of Silvafeed Nutri P can contribute to reduce antimicrobial resistance. ■