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Effect of supplementation of polyherbal feed additives on growth performance and nutrient digestibility in crossbred (LWY X Desi) finisher pigs

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Abstract

The present experimental trial was conducted to evaluate the effect of polyherbal feed additives on the growth performance and nutrient utilisation of pigs during the finisher phase. Five groups of six pigs each with body weight of 35 kg were fed a common concentrate feed mixture (CFM) without any herbal feed supplements (T0), CFM with Restobal @ 15ml/day/animal mixed with feed once in every three days (T1), CFM with Stresomix @ 250g/tonne (T2), CFM with Ruchamax (T3) and Nbiotic (T4) each @ 500g/tonne, respectively up to attaining of live weight about 70 kg. During the experiment, the daily feed intake as well as weekly body weight was recorded. A digestion trial of seven-day duration was conducted at the end of feeding trial. Addition of herbal feed supplements did not significantly (p>0.05) influence the initial, final body weights and feed consumption (kg/day) of pigs. Among all experimental groups of pigs, pigs fed with Stresomix (T2) attained 70 kg from 35 kg body weight in 75 days, followed by T3 and T4 groups in 79 days and T1 group in 82 days and T0 groups in 90 days. Significant (p<0.05) increase in CP digestibility was found in pigs fed with herbal feed supplements (T1 to T4) than control diet (T0) and there was no significant (p>0.05) difference in digestibility of other nutrients.It was observed that including polyherbal preparations

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at an acceptable dose with concentrate feed will improve pig performance and nutrient digestibility while having no negative impact on their health.

Keywords: *Finisher pigs, growth performance, nutrient digestibility poly herbal supplements*

The emergence of microbial resistance to antibiotics and its implications for human health, as well as consumer pressure to eliminate all non-plant xenobiotics from animal diets, have increased interest in herbal feed additives in livestock production.Phytogenic feed additives (PFAs) are plants or phytobiotics used in conventional therapies. They could be utilised as antibiotic alternatives (Franz *et al*., 2020). Phytogenic feed additives use in swine diet has recently gained popularity. In comparison to non-antibiotic growth promoters such as organic acids and probiotics, which are widely established in animal nutrition, phytobiotics are relatively recent feed additions. Our understanding of their mechanisms of action and application is currently very limited. Plant-derived products such as essential oils (volatile lipophilic compounds), herbs (flowering, non-woody and non-persistent plants), spices (herbs with an intensive smell or taste commonly added to human food) and oleoresins (extracts derived by non-aqueous solvents) are examples of phytobiotics.They can be added to commercial animal diets to increase productivity by increasing feed characteristics, promoting animal production performance and improving the quality of products obtained from these animals (Windisch*et al.,* 2008).There has been little investigation into the use of herbal medications in pigs. Hence, the current study was conducted to evaluate the growth performance and nutrient utilisation in finisher pigs using herbal feed supplements such as Restobal, Stresomix, Ruchamax and Nbiotic.

Materials and methods

The experiment was carried out at ICAR-All India Coordinated Research Project on Pigs, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India. 30 crossbred LWY male pigs (75% inheritance) weighing about 35 kg belonging to ICAR-AICRP on pigs were chosen and randomly allotted to five groups of six pigs each using completely randomised block design (CRD). All of the pigs were kept in separate pens with individual feeding and watering in a well-ventilated animal shed. Before the trial, all of the pigs were dewormed.Five isonitrogenous experimental diets were developed in accordance with NRC (2012) and fed during the finisher (35-70 kg body weight) phase.The feed composition of the finisher diet was presented in Table 1.All groups were fed with common concentrate feed mixture (CFM).The group without any herbal feed supplement (T0), CFM with Restobal (Ayurvet limited) @ 15ml/day/animal mixed with feed once in every three days (T1), CFM with Stresomix (Ayurvet limited) @ 250g/tonne (T2), CFM with Ruchamax (Ayurvet limited) (T3) and Nbiotic (Ayurvet limited) (T4) each @ 500g/ tonne, respectively up to attaining of live weight about 70 kg.

All the five groups were offered respective experimental rations daily at 10 AM and 3 PM by weighing in electronic balance and residue was weighed after 24 h. The pigswere

Table 1. Ingredients of experimental finisherdiet

Constituents	T0	T1	T2	T3	T4
Maize	50	50	50	50	50
Soya bean meal	19	19	19	19	19
Deoiled rice bran	29	29	29	29	29
Salt	0.5	0.5	0.5	0.5	0.5
Mineral mixture	1.5	1.5	1.5	1.5	1.5
Lysine	0.1	0.1	0.1	0.1	0.1
Polyherbal feed additive	-	Restobal 15ml/ day/animal/ once in three days	Stresomix (25g/100 kg)	Ruchamax (50g/100 kg)	Nbiotic (50g/100 kg)

fed with finisher ration.The pigs were examined once a day for clinical signs of illness and demise.Pigs were then weighed before feeding and watering during the study period at weekly intervals to track average weight changes. Feed intake per unit gain was used to determine the efficiency of the feed. The average daily gain and feed conversion ratio were calculated.

Nutrient digestibility

All 30 pigs were subjected to a seven-day digestion trial at the end of the finisher phase to examine the apparent digestibility of nutrients, with manual total collection of the faeces excreted by each pig.The moisture was determined immediately and the nitrogen content and crude protein was estimated using the fresh samples. Balance samples were dried and ground for rest of the analysis as per standard procedure (AOAC, 2016). The apparent digestibility coefficients of dry matter, crude protein, ether extract, crude fibre and nitrogen free extract were calculated.

Statistical analysis

The data collected during the experiment were analysed using one way ANOVA in SPSS statistical software (Version 22, Chicago, USA) and Mean ± SE values were presented in accordance with the procedures outlined by Snedecor and Cochran (1994), with significant differences in the means denoted by $p<0.05$.

Results and discussion

The data on the growth performance of pigs fed on control (T0) and experimental diets (T1 to T4) during finisher phase were detailed in Table 2. The results revealed that the initial and final body weights as well as weight gain were not significant ($p>0.05$) among the polyherbal supplemented groups(T1 to T4) and control (T0). The number of days taken by the pigs to reach 70 kg from 35 kg were 90, 82, 75, 79 and 79 days, respectively for control (T0) and polyherbal supplemented groups(T1 to T4) during the finisher phase. The number of days taken by pigs fed on T2, T3 and T4 were significantly ($p<0.05$) lower when compared to control (T0) and was found similar among the polyherbal supplemented groups. The average daily gain (ADG) of pigs fed on T2, T3 and T4 were significantly ($p<0.05$) higher than those fed on control (T0). The average daily feed consumption (kg) wasnot significant ($p>0.05$) among the treatments (T0 to T4).The feed consumption/kg gain was significantly ($p<0.05$) lower in polyherbal supplemented groups(T1 to T4) compared to control group (T0).

The enhanced development and performance in the polyherbal supplemented groups of pigs could be attributed to improved nutrient digestibility, as herbs and herbal products can limit and restrict the growth and colonisation of various pathogenic and non-pathogenic species of bacteria in the gut.

Table 2. Effect of herbal feed supplements on growth and performance of finisher pigs*

Characteristics	T0	T1	T2	T3	T4	p-value
Initial body weight (kg)	35.03±1.35	35.53±1.02	35.50±0.79	35.61±0.6	35.81±1.2	0.98^{ns}
Final body weight (kg)	70.58±0.37	71.03±0.32	71.35±0.61	70.5±0.5	71.16±0.65	0.71^{ns}
Weight gain (kg)	35.55±1.02	35.5±0.75	35.84±0.36	34.88±0.31	35.35±0.70	0.89^{ns}
No. of days	90^{b}±2.42	82^{ab}±3.75	75^{a}±2.89	79^{a}±2.13	79^{a}±4.18	0.03*
Daily gain (g/d)	394^{a}±0.006	433^{ab}±0.01	477^{b}±0.01	442^{b}±0.01	453^{b}±0.02	0.012*
Feed intake (kg/d)	1.71±0.04	1.77±0.09	1.83±0.06	1.74±0.04	1.80±0.11	0.8^{ns}
FCR	4.35^{b}±0.5	4.09^{a}±0.5	3.85^{a}±0.21	3.96^{a}±0.13	3.96^{a}±0.47	0.002*

Means bearing different superscripts in a row differ significantly ($p<0.05$); ns-Non significant ($p>0.05$); (*n=6)

T0 = Pigs fed without any herbal supplements (Control).

T1 = Pigs supplemented with Restobal.

T2 = Pigs supplemented with Stresomix.

T3 = Pigs supplemented with Ruchamax.

T4 = Pigs supplemented with Nbiotic.

This may result in enhanced feed efficiency and growth, as herbs can stimulate appetite, regulate digestion and metabolism in animals and have growth promoting effects. Restobal liquid contains *Phyllanthus emblica*, *Glycehrriza glabra, Asparagus racemosus, Ocimum Sanchum* etc and medicinal properties of these plant materials were reported by various researchers (Varsha *et al*., 2013; Lavanya *et al.,* 2023). Similar to these results, Chen *et al.,* (2023) supplementation of fermented Chinese herbs improved the growth performance and nutrient digestibility of weaned piglets by promoting the secretion of intestinal digestive enzymes and promoting intestinal health.

Nutrient digestibility

The data on the digestibility (%) of nutrients in control (T0) and experimental groups (T1 to T4) during finisher phase were shown in Table 3. During the finisher phase, the percent CP digestibility was higher ($p<0.05$) in polyherbal supplemented groups (T1 to T4) than in control (T0). The DM digestibility was higher in polyherbal supplemented groups (T1 to T4) but significant ($p<0.05$) difference was noticed in antistressorStresomix (T2) and growth promoter Ruchamax (T3) supplemented groups than in control (T0). The digestibility of OM, CF and NFE were comparable among treatments.

These plant components powerful antioxidant, anti-stressor, hemopoietic, rejuvenating and performance-enhancing capabilities have been scientifically established. Stresomix is a potent herbal formulation, which contains 28 different herbs and some minerals. The ingredients of Stresomix include *Ocimum sanctum*, *Withania somnifera*, *Tribulus terrestris*, *Mangifera indiaca*, *Asparagus racemosus* and *Phyllanthus emblica*. These plant materials have been clinically demonstrated to have powerfulappetite and digestion stimulation properties (Vinus*et al*., 2018).Stresomix is efficacious to improve tissue growth in the piglets (Kumar *et al.,* 2015).Ruchamax contains *Phyllanthus emblica, Terminalia bellirica, Allium sativum, Zinziber officinale, Trychyspermum ammi* and other ingredients. Some constituent herbs have been scientifically demonstrated to have appetiser, restorative, carminative, stomachic and tonic effects. Ruchamax's components, such as *Allium sativum* and *Zingiber officinale* have been reported to be good appetisers and stomachics (Walia*et al*., 2011 and Lavanya *et al.,* 2023). Nbiotic is the perfect fusion of secondary plant metabolites and essential oils. The principal elements of this composition are herbs such *Allium sativum*, *Zingiber officinale*, *Cichorium intybus*, *Erucasativa*, *Eucalayptus globulus*, *Trigonella foenumgraecum, Cinnamomum-camphora* and *Menthapiperata* as well as essential oils such as *Trychyspermum ammi*. Terpenoids, alkaloids, flavonoids, bitters and tannins are among the secondary plant metabolites found in these herbs(Lavanya *et al.,* 2023).Theyact as

Table 3. Effect of herbal feed supplements on nutrient digestibility of finisher pigs*

Nutrients	T0	T1	T2	T3	T4	p-value
Dry matter	$72.12^{a}\pm1.67$	$75.16^{ab}\pm1.32$	$77.22^{b}\pm0.68$	$76.40^{b}\pm1.49$	$75.14^{ab}\pm1.19$	0.10^{ns}
Organic matter	74.06±0.81	76.57±1.33	76.68±1.24	75.55±1.92	74.11±2.03	0.08^{ns}
Crude protein	$72.30^{a}\pm0.92$	$76.23^{b}\pm0.99$	$77.14^{b}\pm0.97$	$77.08^{b}\pm1.19$	$76.16^{b}\pm1.32$	0.04*
Crude fibre	42.13±0.64	42.05±1.15	43.25±0.78	42.24±0.8	41.63±0.52	0.69^{ns}
Ether extract	60.72±1.72	63.01±1.72	62.49±1.91	61.79±0.32	61.97±1.14	0.39^{ns}
Nitrogen free extract	86.78±0.7	87.15±0.59	85.43±1.2	86.16±0.66	86.04±0.84	0.65^{ns}

Means bearing different superscripts in a row differ significantly ($p<0.05$);ns-Non significant ($p>0.05$); (*n=6)

T0= Pigs fed without any herbal supplements (Control).

T1 = Pigs supplemented with Restobal.

T2 = Pigs supplemented with Stresomix.

T3 = Pigs supplemented with Ruchamax.

T4 = Pigs supplemented with Nbiotic.

a natural growth stimulant when combined in a synergistic manner via polyherbal preparation. Natural growth promoters have a substantial benefit over antibiotic growth promoters in that they do not cause bacterial resistance or undesirable residue in animal products (Chattopadhyay *et al*., 2014).

According to Chrubasik *et al.,* (2005), a wide variety of phytobiotics (including herbal plants and their extracts) are known to have positive effects on the digestive tract (such as laxative and spasmolytic effects). They can also help to prevent flatulence.Platel and Srinivasan (2004) also proposed that phytobiotics can promote digestive secretions such as saliva and bile. They reported that the primary route of nutritional impact of PFA is to improve enzyme activity.

The obtained results in this experiment were in accordance with the findings of Davila-Ramirez *et al*. (2020), addition of plant extracts improves pig growth performance by reducing the negative effects of heat stress. Sampath *et al.,* (2020) reported that supplementation of black pepper improved the growth performance and nutrient digestibility of finishing pigs.Sun and Kim (2020) also found thatsupplementation of a mixture of yeast culture, garlic extract and garlic essential oil (YGM) in finishing pigs improved the growth performance, nutrient digestibility and meat quality.

Conclusion

The supplementation of phytobiotcs/ polyherbal feed additives in finisher pigs improved the growth performance, feed conversion ratio and nutrient digestibility without side effects when poly herbal additives were added to concentrate rations at the proper dose. When compared to other antistressorRestobal and growth promoters Ruchamax and Nbiotic supplemented groups, Stresomix supplemented group was shown to have higher performance characteristics, however no significant difference was seen between them. Thus, polyherbal preparations can be used as a healthier alternative to antibiotic growth promoters in pigs.

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Conflict of interest

The authors declare that they have no conflict of interest

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