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Effect of herbal anti-stressors and growth promoters on the performance of crossbred pigs

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Abstract
The present investigation entitled "Evaluation of herbal anti-stressors and growth promoters on the performance of crossbred weaned pigs" was conducted on 30 crossbred (Large White Yorkshire) male pigs by dividing into five groups of six pigs each. Each group was allotted to one of the five dietary treatments in a completely randomized design (CRD). Treatment-0 (T_0 control) comprised of concentrate feed mixture (CFM) without any herbal supplementation. Treatment 1 (T_1) consisted of CFM with Restobal at 15 ml per day for ten days in a month. Treatment 2 (T_2) included CFM with 250 g/tonne of feed of the Stresomix polyherbal supplement. Treatment 3 (T_3) included CFM and 500 g/tonne of feed of the polyherbal supplement Ruchamax. Treatment 4 (T_4) included CFM and a 500 g/tonne of feed Nbiotic polyherbal supplement. The pigs were fed as per requirement of NRC (2012) during grower and finisher phases. During the experiment, the daily feed intake and weekly body weight were recorded. The overall growth performance (11-70 kg) of control (T_0) and experimental groups (T_1 to T_4) revealed that among all experimental groups of pigs, pigs fed with Stresomix (T_2) attained 70 kg body weight in 143 days only followed by T_3 groups in 151 days, T_4, T_1 and T_0 groups in 152, 156, 170 days, respectively. There was no significant ($p>0.05$) difference among the experimental groups (T_0 to T_4) in the initial and final weights as well as body weight gain. The average daily gain (ADG) was significantly ($p<0.05$) higher in polyherbal supplemented groups (T_1 to T_4) when compared to control (T_0). The feed consumption was significantly ($p<0.05$) higher and feed consumed/kg gain was significantly ($p<0.05$) lower in T_2 compared to T_0 and there was no significant ($p>0.05$) difference among other treatment groups.

Keywords: Polyherbal supplements, pigs, anti-stressors, growth promoters and growth performance

1. Introduction
Due to some natural characteristics, such as high fecundity, improved feed conversion efficiency, early maturity and short generation interval, pigs have a greater potential than other livestock species to provide farmers with a faster return on their investment. Tropical and sub-tropical regions like India frequently experience environmental temperatures exceeding the zone of thermal neutrality (comfort zone) for swine (Lavanya *et al.*, 2023) [1]. When the animals are exposed to heat stress most of its energy is diverted to combat the stress thereby reducing its performance. Organic, synthetic, chemical, or simple inorganic components used to increase the animal growth and/or feed conversion ratio are known as performance enhancers or growth promoters. The most often utilised performance enhancers in animal production are antibiotics and chemotherapy medicines. In assessing potential alternatives to subtherapeutic use of antibiotics, one must take into account not only the relative short and long-term costs but also their ability to produce the same growth promoting effects as the antibiotics without any negative effects. This is necessary due to the emergence of bacterial strains that are resistant to antibiotics and the lingering effects on consumer health. The recent ban on the use of antibiotic growth promoters in animal feeds has also piqued researchers interest in the existence of other natural compounds, such medicinal herbs, as a new class of additives to animal feeds. (Bhaskar Reddy *et al.*, 2023) [2]. So, there has been an increased interest in the utilization of growth promoters of natural origin, as an alternative to chemotherapeutics. In this respect, the use of herbal supplements seems to be very promising. Herbs can be applied in the form of dried material or extracts containing active substances. These plant products are used either single or in combination (polyherbs) to elicit better effect as medicine (Roopa *et al.*, 2017) [3]. Further, meat produced by using these natural herbs also results a positive consumer attitude and cconsumer preferences for "natural" meat and meat products which have led to a rise in interest in using natural herbal feed additives in livestock (Bhaskar Reddy *et al.*, 2013) [4].

However, there is little available information on the dosage and safety of commercial polyherbal formulations used as feed supplements on different species of livestock and the use of herbal remedies in pigs has received limited scientific investigation. Consequently, the objective of the current investigation was to ascertain the anti-stress impact and growth pattern in the growing pigs by the use of herbal anti-stressor formulations like Restobal, Stresomix and growth promoters like Ruchamax, Nbiotic in summer months

Materials and Methods

Thirty crossbred LWY male pigs (75% inheritance) of 45 days of age and around 11.50 kg body weight belonging to ICAR-All India Coordinated Research Project on Pigs, Tirupati, Andhra Pradesh, India were selected and allotted randomly into five groups, each with six pigs. The test substances Restobal, Stressomix, Ruchamax and Nbiotic were procured from M/S Ayurvet Limited, Katha (Vill), Baddi (P.O) Solan (Dist), India. All the pigs were kept in separate pens with access to individual feeding and watering in a well-ventilated animal shed. All the pigs were dewormed before the start of the trial. According to NRC (2012) [5], five isonitrogenous experimental diets were formulated and fed to the pigs during the grower and finisher phases. Treatment-0 (T_0) comprised of concentrate feed mixture (CFM) which acts as control. Treatment-1 (T_1) comprised of CFM with Restobal (Ayurvet limited) @ 15 ml/ animal/day mixed with feed once in every three days. Treatment-2 (T_2) contains CFM with Stresomix (Ayurvet limited) @ 250 g/tonne of feed. Treatment-3 (T_3) contains CFM with Ruchamax (Ayurvet limited) @ 500 g/tonne of feed. Treatment-4 (T_4) contains CFM with Nbiotic (Ayurvet limited) @ 500 g/tonne of feed. The composition of grower and finisher feed was given in (Table I). 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 pigs with the live body weight of 11–35 kg were fed with grower feed and 35 to 70 kg body weight were fed with finisher feed. The piglets were observed for clinical signs and mortality once a day. Piglets were first weighed before being fed and given water for two days in a row at the commencement of the experiment. Piglets were then weighed before feeding and watering during the experimental period at weekly intervals to measure the average body weight changes. Feed intake per unit gain was used to determine the efficiency of the feed. Feed conversion ratio and average daily gain were estimated.

Table 1: Ingredients of experimental grower and finisher diets[a]

Constituents	T_0		T_1		T_2		T_3		T_4	
	Grower	Finisher	Grower	Finisher	Grower	Finisher	Grower	Finisher	Grower	Finisher
Maize	60	50	60	50	60	50	60	50	60	50
Soya bean meal	24	19	24	19	24	19	24	19	24	19
Deoiled rice bran	14	29	14	29	14	29	14	29	14	29
Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Mineral Mixture	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lysine	0.09	0.1	0.09	0.1	0.09	0.1	0.09	0.1	0.09	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)	
[a] on Dry Matter basis except for DM;										

Statistical Analysis

Using SPSS statistical software (Version 22, Chicago, USA), the data generated during the experimental period were analysed through one-way ANOVA. Mean S.E. values were presented in accordance with the procedures outlined by Snedecor and Cochran (1995) [6], and significant differences in the means were expressed as $p<0.05$.

Results and Discussion

The data on the total growth performance (11-70 kg) of pigs fed with different polyherbal formulations were shown in Table 2. The initial and final weights as well as the body weight gain of the pigs fed T_0 to T_4 did not differ significantly ($p>0.05$). The number of days taken by the pigs to reach 70 kg from 11 kg body weight were 170, 156, 143, 151 and 152 days, respectively for control (T_0) and experimental groups (T_1 to T_4). The average daily gain (ADG) was 347.3, 384.5, 421.5, 391.2, 395.0 g, respectively for control (T_0) and experimental groups (T_1 to T_4). Significantly ($p<0.05$) higher average daily gain (ADG) was observed in experimental groups (T_1 to T_4) than control (T_0). The average daily feed intake was 1.53, 1.65, 1.75, 1.67 and 1.68 kg, respectively for control (T_0) and experimental groups (T_1 to T_4). The feed consumption was significantly ($p<0.05$) higher in T_2 group compared to control (T_0) and there was no significant ($P>0.05$) difference among other treatment groups. The feed consumed/kg gain was 4.42, 4.29, 4.16, 4.28 and 4.27, respectively for control (T_0) and experimental groups (T_1 to T_4). The feed consumed/kg gain was significantly ($p<0.05$) lower in T_2 compared to T_0 and there was no significant ($p>0.05$) difference among other treatment groups. Herb supplements could enhance the taste and palatability of the feed, boost the animals appetites, and increase the amount of feed they consume (Mirzaei-Aghsaghali, 2012) [10]. As a result, the improved average daily gain may be influenced by the higher feed intake.

Table 2: Effect of herbal anti-stressors and growth promoters on the overall growth performance of pigs (11-70 kg body weight)

Characteristics	T_0	T_1	T_2	T_3	T_4
Initial body weight (kg)	11.5±1.24	11.48±1.06	11.2±0.76	11.5.22±0.63	11.43±1.19
Final body weight (kg)	70.58±0.37	71.03±0.32	71.35±0.61	70.5±0.5	71.16±0.65
Weight gain (kg)	59.08±0.93	59.55±0.81	60.06±0.30	59.00±0.33	59.7±0.65
No. of days*	170^{b}±3.85	156^{ab}±6.77	143^{a}±5.10	151^{a}±4.14	152^{a}±5.57
Daily gain (g/d) *	347.3^{a}±39.9	384.5^{b}±14.08	421.5^{c}±13.30	391.2^{bc}±10.41	395^{bc}±13.7
Feed intake (kg/d) *	1.53^{a}±0.04	1.65^{ab}±0.08	1.75^{b}±0.06	1.67^{ab}±0.05	1.68^{ab}±0.07
Feed consumed / kg gain*	4.42^{b}±0.10	4.29^{ab} ±0.73	4.16^{a}±0.01	4.28^{ab}±0.08	4.27^{ab}±0.06

Means with the same superscript (s) are not statistically different from one another in a row *(P<0.05) (*n=6).

T_0= Pigs fed without any herbal supplements (Control).

T_1 = Pigs supplemented with Restobal.

T_2 = Pigs supplemented with Stresomix.

T_3 = Pigs supplemented with Ruchamax.

T_4 = Pigs supplemented with Nbiotic.

Restobal liquid contains *Phyllanthus emblica, Glycehrriza glabra, Asparagus racemosus, Ocimum Sanchum* etc. are scientifically well proven to possess potent adaptogenic, anti-stressor, immune potentiating and performance enhancing properties (Ambore *et al.,* 2009) [7]. The Stresomix include *Withania somnifera, Ocimum sanctum, Mangifera indiaca. Tribulus terrestris,* and *Phyllanthus emblica* many more. Scientific research has shown that each of these herbs' unique constituents has tonic, stomachic, restorative, and appetizer properties. (Lavanya *et al.,* 2023) [1]. Ruchamax is a strong herbal combination of minerals and 28 different herbs. Ruchamax contains *Phyllanthus emblica, Zinziber officinale, Terminalia bellirica, Allium sativum, Trychyspermum ammi* and other substances. Certain constituent herbs have been scientifically proven to have appetizer, restorative, carminative, stomachic and tonic properties. Ruchamax's components, such as *Allium sativum* and *Zingiber officinale* have been reported to be good appetizers and stomachics (Walia *et al.,* 2011) [8]. Nbiotic herbal feed additive contains extracts from the plants *Allium sativum, Zingiber officinale, Eucalayptus globulus Eruca sativa, and Trigonella foenumgraecum*. Growth and antioxidant status are promoted by it. (Giannenas *et al.,* 2019) [9].

The production of bile acids in the liver and their excretion in bile are enhanced by herbs including *Phyllanthus emblica, Zingiber officinale, Allium sativum*, and *Trigonella foenumgraecum*, which has a positive impact on the digestion and absorption of lipids and increased growth performance. The majority of the pre-listed spices promote the action of digestive enzymes in the stomach mucosa as well as pancreatic enzymes (lipases, amylases, and proteases). Extracts from herbs and spices speed up digestion and reduce the amount of time that feed and food need to travel through the digestive tract in addition to their impact on bile formation and enzyme activity (Mirzaei-Aghsaghali, 2012) [10]. In the stomach and intestine, herbal extracts appear to promote mucus secretion. A range of harmful and non-pathogenic kinds of bacteria are prevented from proliferating and colonising the gut as a result of this impact, it is possible that the enhanced growth and performance in the polyherbal supplemented groups of pigs are the result of improved nutrient digestibility (Alloui *et al.,* 2013) [11]. This could result in more effective feed consumption, which would improve growth and feed efficiency. Additionally, herbs may increase appetite, control digestion and metabolism, and promote growth in livestock. The results obtained in this study were in concurrent with the findings of Gyani *et al.* (2016) [12], Roopa *et al.* (2017) [3], Lei *et al.* (2018) [13], Jung *et al.* (2019) [14] and Sampath *et al.* (2020) [15].

Conclusion

On the basis of the above results, it can be concluded that supplementation of polyherbal feed additives improved the performance characteristics of pigs when compared to control and among the polyherbal supplemented groups, Stresomix supplemented group found to have better performance characteristics by combating heat stress when compared to other antistressor Restobal and growth promoters Ruchamax and Nbiotic supplemented groups although no significant difference was observed between them. Hence, polyherbal formulations can be added to concentrate ration without causing any adverse effects, and they can be utilised as an alternative to antibiotic growth promoters in pigs.

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