



Effect of Dietary Supplementation of Turmeric (*Curcuma Longa*) on Health Status of Young Pigs During Pre and Post Weaning Periods


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ABSTRACT

The present research programme was conducted to study the effect of turmeric (*Curcuma longa*) powder supplementation on the growth performance and health status of Large White Yorkshire young pigs. A total number of 128 (12 litters) young pigs weaned at 28 days old were taken for the study period of 56 days. The young pigs in their respective litters were randomly divided into three groups viz., Control (C) fed basal diet, Treatment-1 (T₁) fed basal diet+0.5% turmeric powder and Treatment-2 (T₂) fed basal diet+1% turmeric powder in such a way that there were 4 replicates in each group with 1 litter as one replicate. Parameters recorded were general appearance, occurrence rate of diarrhea and faecal consistency. Statistical analysis revealed significant ($p < 0.05$) differences in general appearance score during the post-weaning periods. Statistical analysis also revealed significant ($p < 0.05$) differences in occurrence rate of diarrhoea (%) on 5th week under three different groups and significant ($p < 0.05$) differences between the different groups during the post weaning (5th to 8th week) period, highly significant ($p < 0.01$) differences in faecal consistency score between the groups during post weaning (5th to 8th week) and overall (1st to 8th week) periods. It may be concluded that dietary inclusion of dry turmeric powder at 1.0% level in pre and post weaning diets is beneficial - for growth performance of LWY young pigs especially during post weaning period.

KEYWORDS: *Curcuma longa*, health status, turmeric, large white yorkshire

Citation (VANCOUVER): Stevenson et al., Effect of Dietary Supplementation of Turmeric (*Curcuma Longa*) on Health Status of Young Pigs During Pre and Post Weaning Periods. *International Journal of Bio-resource and Stress Management*, 2023; 14(2), 279-284. [HTTPS://DOI.ORG/10.23910/1.2023.3307a](https://doi.org/10.23910/1.2023.3307a).

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Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

Conflict of interests: The authors have declared that no conflict of interest exists.



1. INTRODUCTION

Livestock sector plays an important role in socio-economic development of rural households. Livestock rearing has symbolic positive impact on keenness in terms of income and employment and poverty reduction especially in the rural areas as distribution of livestock is more egalitarian as compared to land (Ali, 2007). Among the various livestock species, piggery farming finds an important role as it is being reared by socio-economically weaker sections particularly in the rural areas. According to the 20th Livestock Census, 2019, out of 9.06 million of the total pig population, 46.85 % (4.24 million) is available in the North East Region (NER) of India. (Anonymous, 2019). Pigs have a greater potential than other livestock animals to contribute to faster economic profits for farmers due to innate characteristics such as high productivity, better feed conversion ratio, early maturity, shortened generation interval, and so on (Adebiyi et al., 2014). Despite these numerous opportunities in pig husbandry and pig-based production farms, pig farmers face several challenges in pig farming. The piggery production mainly faced the issue of maximum cost benefits and optimum performance of animals from increasingly complex mixes of raw. A variety of factors, including microbiological, environmental, and dietary factors, can cause post-weaning diarrhoea and growth reduction in early weaned pigs. It is suggested that alterations of the small intestinal structure are an important mechanism of post-weaning diarrhoea and growth check (Pluske et al., 1997). The pig industry faces a challenge in producing pigs without the use of antibiotic growth promoters. Phytogenic feed additives have been proposed as effective additives in swine production for potential beneficial effects on pig performance and health (Manzanilla et al., 2004). One of the most beneficial phytogenic plant includes turmeric (*Curcuma longa*) which possess several profitable properties. The spice turmeric is a botanical plant that is widely used in the Middle East and Asia. It not only imparts a distinct flavour to foods, but it is also thought to have several health benefits and is used in traditional medicine.

The turmeric has been recently used in addition to nutraceuticals, several beverages, along with many processed foods. Turmeric, which is obtained from the rhizome of a plant *Curcuma longa* (Zingiberaceae family) comprises of three curcuminoids, curcumin (Curcumin I), demethoxycurcumin (Curcumin II), and bisdemethoxycurcumin (Curcumin III) (Singletary, 2020). The rhizome of *Curcuma longa* has been traditionally used as an antimicrobial agent and is also a good insect repellent (Yesuf et al., 2017). Curcumin has been studied for its anti-microbial properties (Dixit et al., 1988), including its antibacterial, antiviral, antifungal, and antimalarial activities (Rai et al., 2020).

Turmeric contains 6.3% protein, 5.1% fat, 13.1% moisture, 69.4% carbohydrates, and 3.5% minerals (Chattopadhyay et al., 2004). Turmeric extracts have anti-inflammatory, antioxidant activity (Joe and Lokesh, 1997), and anticancer agents (South et al., 1997). These properties of turmeric could provide beneficial effects for the better performance of pigs as a feed additive. Barad et al (2016) reported that turmeric has the potential to improve growth performance and immune status in pigs due to its pleiotropic properties. Findings of research work on the effect of turmeric on the performance of livestock, and poultry are promising (Sinaga and Martini, 2010; Recharla et al., 2021). However, there is little information available on the use of turmeric as feed additives for young pigs particularly during pre and post-weaning periods. And the addition of turmeric in young pig's diets might be very much helpful to counter digestive health-related issues during pre and post-weaning periods, especially in early-weaned pigs. Considering the importance and above facts in mind, the present programme was conducted to study the effect of turmeric on health of young pigs during pre and post-weaning periods.

2. MATERIALS AND METHODS

2.1. Location and period of study

The experiment was conducted at the piggery unit of Livestock Farm Complex, College of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram, India, which is located at 1020 m altitude and 23°44'12N latitude. The period of study was 5 months i.e., January – June, 2021.

2.2. Experimental animals and design

For the purpose of the study, a total number of 128 Large White Yorkshire young pigs from 12 litters having at least 6 piglets/litter were used. All the piglets were identified individually just after birth and their body weights were recorded. Considering the litter size and litter weight at birth, parity number and sire number, all the twelve litters were subdivided into three homogenous groups (Control-C, T₁-Treatment 1 and T₂-Treatment 2). Pigs of Group C were fed with the basal diet without any supplementation of turmeric and therefore they served as control. Feed containing dried turmeric powder purchased from local market were fed to the young pigs of T₁ and T₂ group @ 0.5% and 1%, respectively. The feeding trial was conducted for a period of 42 days (Day 14–55).

2.3. Feeding

All the experimental animals were fed with standard rations prepared as per NRC standards (Anonymous, 2012) by using conventional feed ingredients including skimmed milk powder. Pigs of Group C were fed with the basal diet without any supplementation of turmeric and therefore they



served as control. Feed containing dried turmeric powder @ 0.5% and 1% were fed to the young pigs of T₁ and T₂ group respectively.

The body weight of the animals was taken during morning periods before feeding on weekly basis from day 0 to day 56. Weight of the feed given was taken and the residues were taken for dry matter analysis.

2.4. Statistical analysis

The recorded data from the study were subjected to statistical analysis using appropriate formulae for accurate comparison and interpretation (Snedecor and Cochran, 2004).

3. RESULTS AND DISCUSSION

3.1. General appearance

The mean (± SE) general appearance score of Large White Yorkshire (LWY) young pigs from 1st week to 8th week along with pre-weaning (1st to 5th week), post-weaning (5th to 8th week) and overall (1st to 8th week) are presented in Table 1.

The mean (±SE) general appearance score of Large White Yorkshire (LWY) young pigs on 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th weeks along with pre-weaning (1st – 5th week), post-weaning (5th–8th week) and overall (1st–8th week) are 0.25±0.03, 0.28±0.03, 0.28±0.04; 0.28±0.03, 0.32±0.03, 0.27±0.03, 0.29±0.03, 0.28±0.03, 0.22±0.03, 0.28±0.03, 0.28±0.03; 0.76±0.06, 0.52±0.05, 0.35±0.04; 0.33±0.04, 0.32±0.04, 0.29±0.04; 0.22±0.03, 0.23±0.03, 0.26±0.03; 0.25±0.02, 0.29±0.02, 0.28±0.02; 0.38±0.02, 0.32±0.02, 0.27±0.02 and 0.32±0.01, 0.31±0.01, 0.27±0.01 respectively for C, T₁ and T₂ groups.

Statistical analysis revealed non-significant ($p > 0.05$) differences between the groups during 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, pre weaning (1st to 5th week) and overall (1st to 8th week) periods. Statistical analysis also revealed significant ($p < 0.05$) differences between the three groups during the post weaning (5th to 8th week) period between C, T₁ and T₂ groups. It is clear that general appearance scores of young pigs during pre-weaning periods were not affected by turmeric feeding. Low amount of turmeric intake due to low average daily feed intake during pre-weaning period, might have resulted in non-significant differences in general appearance scores among young pigs reared under different groups. On the other hand, from the results of present study, it is clear that turmeric feeding (1%) have significantly ($p < 0.05$) positive effect on general appearance scores of young pigs during post weaning period (week 5 and week 5–8). The beneficial effect of turmeric such as antibacterial, anti-stress, antioxidative, anti-inflammatory, antihepatotoxic ascorbic acid, tannins, flavonoids etc. might have contributed better health (low post weaning diarrhoea)

Table 1: Mean (±SE) general appearance of LWY young pigs under different groups

Age (week)	Control (C)	Treatment-1 (T ₁)	Treatment-2 (T ₂)	p-Value
1	0.25±0.03	0.28±0.03	0.28±0.04	0.48 ^{NS}
2	0.28±0.03	0.32±0.03	0.28±0.03	0.57 ^{NS}
3	0.27±0.03	0.29±0.03	0.28±0.03	0.74 ^{NS}
4	0.22±0.03	0.28±0.03	0.28±0.03	0.32 ^{NS}
5	0.76±0.06	0.52±0.05	0.35±0.04	0.62 ^{NS}
6	0.33±0.04	0.32±0.04	0.29±0.04	0.84 ^{NS}
7	0.22±0.03	0.23±0.03	0.26±0.03	0.58 ^{NS}
8	0.20±0.03	0.23±0.03	0.17±0.03	0.69 ^{NS}
Pre weaning (1 st –5 th week)	0.25±0.02	0.29±0.03	0.28±0.00	0.10 ^{NS}
Post weaning (5 th –8 th week)	0.38±0.02 ^b	0.32±0.02 ^{ab}	0.27±0.02 ^a	0.02 [*]
Overall (1 st –8 th week)	0.32±0.01	0.31±0.01	0.27±0.01	0.28 ^{NS}

(*) Significant ($p < 0.05$) and NS Non significant Note: Means bearing at least one common uppercase in each row do not differ significantly

and general appearance in young pigs (Mishra et al., 1990; Osawa et al. (1995) Platel and Srinivasan, 2000; Devendran et al., 2015). The present findings of general appearance scores of young pigs are in agreement with the reports of Pachuau et al. (2019). They recorded activity score of pigs fed with control, antibiotic, turmeric and curcumin with a result of 5, 4.7, 5 and 5 respectively, which showed that turmeric supplementation, provides good effect to the experimental animals. However, not many reports on effect of turmeric on general appearance scores in pigs are available to compare the present findings.

General appearance scores or body condition score of pigs recorded by Mondal et al. (2015), Alagbe (2017), Niu et al. (2019) and Recharla et al. (2021). In their experimental pigs are in agreement with the results of the present study. From the present study it can be inferred that, dietary inclusion of turmeric (1%) helped to improve general appearance of young pigs specially during post weaning period.

2.2. Occurrence rate of diarrhoea (%)

The mean (±SE) occurrence rate of diarrhoea (%) of Large

White Yorkshire (LWY) young pigs from 1st week to 8th week along with pre-weaning (1st to 5th week), postweaning (5th to 8th week) and overall (1st to 8th week) are presented in Table 2.

Table 2: Occurrence rate of diarrhoea (%) in LWY young pigs under different groups

Age (week)	Control (C)	Treatment-1 (T ₁)	Treatment-2 (T ₂)	p-Value
1	12.57	10.67	11.19	0.99 ^{NS}
2	10.47	12.85	10.81	0.92 ^{NS}
3	10.79	11.35	10.42	0.97 ^{NS}
4	10.47	11.35	11.19	0.41 ^{NS}
5	23.85 ^c	16.85 ^b	13.33 ^a	0.03 [*]
6	16.32	12.35	10.31	0.98 ^{NS}
7	7.48	9.65	9.52	0.98 ^{NS}
8	6.80	7.72	6.34	0.43 ^{NS}
Pre weaning (1 st -5 th week)	9.10	11.56	9.18	0.82 ^{NS}
Post weaning (5 th -8 th week)	16.41 ^b	11.87 ^b	7.79 ^a	0.05 [*]
Overall (1 st -8 th week)	12.64	11.71	8.42	0.09 ^{NS}

(*) Significant ($p < 0.05$) and NS Non significant Note: Means bearing at least one common uppercase in each row do not differ significantly

Occurrence rate of diarrhoea (%) in Large White Yorkshire (LWY) young pigs on 1st, 2nd, 3rd, 4th, 5th, 6th, 7, 8th weeks along with pre-weaning (1st-5th week), post-weaning (5th-8th week) and overall (1st-8th week) are 12.57, 10.67, 11.19; 10.47, 12.85, 10.81; 10.79, 11.35, 10.42; 10.47, 11.35, 11.19; 23.85, 16.85, 13.33; 16.32, 12.35, 10.31; 7.48, 9.65, 9.52; 6.80, 7.72, 6.34; 9.10, 11.56, 9.18; 16.41, 11.87, 7.79 and 12.64, 11.71, 8.42 respectively for C, T₁, T₂ groups.

Statistical analysis revealed highly non-significant ($p > 0.05$) differences between the groups during 1st, 2nd, 3rd, 4th, 6th, 7th, 8th and pre weaning (1st to 5th week) periods. Statistical analysis revealed significant ($p < 0.05$) differences in occurrence rate of diarrhoea (%) on 5th week under three different groups and significant ($p < 0.05$) differences between the different groups during the post weaning (5th to 8th week) period. The overall (1st to 8th week) occurrence rate shows non-significant ($p > 0.05$) differences between the different groups. It is clear that occurrence rate of diarrhoea

in LWY young pigs during pre-weaning periods were not affected by turmeric feeding. Low amount of turmeric intake due to low average daily feed intake during pre-weaning period, might have resulted in non-significant differences in occurrence rate of diarrhoea among young pigs reared under different groups. On the other hand, from the results of present study, it is clear that turmeric feeding (1%) had significantly ($p < 0.05$) reduce the occurrence rate of diarrhoea in young pigs during post-weaning period (week 5 and week 5-8). The beneficial effect of turmeric such as antibacterial, anti-stress, antioxidative, anti-inflammatory, antihepatotoxic ascorbic acid, tannins, flavonoids etc. (Akila et al., 1998; Durrani et al., 2006; Recharla et al., 2021), might have contributed in lowering occurrence rate of diarrhoea resulting better health and general appearance in young pigs. Brooks et al. (1984) also reaffirmed antimicrobial and antiinflammatory properties of turmeric. Maneewan et al. (2012) also observed higher Lactobacillus counts, lower E. coli counts and occurrence rate of diarrhoea in turmeric-fed hens than in the basal diet group. Present finding of low occurrence rate of diarrhoea in young pigs fed turmeric powder, is also in agreement with the reports of Yarru et al., (2009) and Recharla et al. (2021). From the present study it can be inferred that, dietary inclusion of turmeric (1%) helped to reduce occurrence rate of diarrhoea in young pigs specially during post weaning period.

2.3. Faecal consistency score

The mean (\pm SE) faecal consistency score of Large White Yorkshire (LWY) young pigs from 1st week to 8th week along with pre-weaning (1st to 5th week), post-weaning (5th to 8th week) and overall (1st to 8th week) are presented in table 3. The mean (\pm SE) faecal consistency score in Large White Yorkshire (LWY) young pigs on 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th weeks along with pre-weaning (1st-5th week), post-weaning (5th-8th week) and overall (1st-8th week) are 0.15 \pm 0.03, 0.22 \pm 0.04, 0.20 \pm 0.04; 0.22 \pm 0.03, 0.28 \pm 0.04, 0.19 \pm 0.03; 0.18 \pm 0.03, 0.25 \pm 0.04, 0.20 \pm 0.03; 0.22 \pm 0.03, 0.25 \pm 0.04, 0.19 \pm 0.03; 0.89 \pm 0.07, 0.52 \pm 0.06, 0.27 \pm 0.04; 0.35 \pm 0.05, 0.26 \pm 0.04, 0.20 \pm 0.03; 0.15 \pm 0.03, 0.20 \pm 0.03, 0.19 \pm 0.03; 0.14 \pm 0.02, 0.15 \pm 0.03, 0.13 \pm 0.03; 0.19 \pm 0.02, 0.25 \pm 0.02, 0.19 \pm 0.02; 0.39 \pm 0.03, 0.25 \pm 0.02, 0.20 \pm 0.02 and 0.29 \pm 0.02, 0.27 \pm 0.02, 0.20 \pm 0.01 respectively for C, T₁, T₂ groups. Statistical analysis revealed non-significant ($p > 0.05$) differences between the groups during 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and pre weaning (1st to 5th week) periods. Statistical analysis also revealed highly significant ($p < 0.01$) differences between the groups during post weaning (5th to 8th week) and T₂ group when compared to T₁ and C group during the overall (1st to 8th week) periods. It is clear that faecal consistency score of LWY young pigs during pre-weaning periods were not affected by turmeric feeding. Low amount of turmeric intake due to low average

Table 3: Mean (\pm SE) faecal consistency score in LWY young pigs under different groups

Age (week)	Control (C)	Treatment-1 (T ₁)	Treatment-2 (T ₂)	p-Value
1	0.15 \pm 0.03	0.22 \pm 0.04	0.20 \pm 0.04	0.31 ^{NS}
2	0.22 \pm 0.03	0.28 \pm 0.04	0.19 \pm 0.03	0.34 ^{NS}
3	0.18 \pm 0.03	0.25 \pm 0.04	0.20 \pm 0.03	0.55 ^{NS}
4	0.22 \pm 0.03	0.25 \pm 0.04	0.19 \pm 0.03	0.69 ^{NS}
5	0.89 \pm 0.07	0.52 \pm 0.06	0.27 \pm 0.04	0.50 ^{NS}
6	0.35 \pm 0.05	0.26 \pm 0.04	0.20 \pm 0.03	0.15 ^{NS}
7	0.15 \pm 0.03	0.20 \pm 0.03	0.19 \pm 0.03	0.61 ^{NS}
8	0.14 \pm 0.02	0.15 \pm 0.03	0.13 \pm 0.03	0.86 ^{NS}
Pre weaning (1 st -5 th week)	0.19 \pm 0.02	0.25 \pm 0.02	0.19 \pm 0.02	0.09 ^{NS}
Post weaning (5 th -8 th week)	0.39 \pm 0.03 ^c	0.25 \pm 0.02 ^b	0.20 \pm 0.02 ^a	0.00 ^{**}
Overall (1 st - 8 th week)	0.29 \pm 0.02 ^b	0.27 \pm 0.02 ^b	0.20 \pm 0.01 ^a	0.00 ^{**}

(**) Highly Significant ($p < 0.01$) and NS: Non-significant
 Note: Means bearing at least one common uppercase in each row do not differ significantly

daily feed intake during pre-weaning period, might have resulted in non-significant differences in faecal consistency score in among young pigs reared under different groups. On the other hand, from the results of present study, it is clear that turmeric feeding (1%) had significantly ($P < 0.01$) improved faecal consistency score in young pigs during post weaning period (week 5 and week 5-8). The beneficial effect of turmeric such as antibacterial, anti-stress, antioxidative, anti-inflammatory, anti-hepatotoxic ascorbic acid, tannins, flavonoids etc might have contributed in reduction of diarrhoea leading to improvement in faecal consistency score in young pigs. Durrani et al. (2006) also revealed the broad-spectrum antimicrobial activity of *C. longa*. Yarru et al. (2009) observed higher Lactobacillus counts, lower *E. coli* counts and occurrence rate of diarrhoea in turmeric-fed hens than in the basal diet group. Present finding of better faecal consistency in young pigs fed turmeric powder, is also in agreement with the reports of Recharla et al. (2021), who recorded significantly ($p < 0.01$) better faecal consistency score in young pigs at 5th week and 6th week of age when weaned at 28th day of age and fed diet containing 1% (w/w) turmeric powder (turmeric).

On the contrary, Akila et al. (1998) observed no difference on fecal scoring in Holstein calves fed 200 mg of curcumin additive per animal/day either in milk (pre-weaning) or concentrate (post-weaning) with the calves reared under control group without curcumin feeding.

4. CONCLUSION

The dietary inclusion of dry turmeric powder at 1.0% level in pre and post weaning diets improved health of LWY young pigs, especially during post weaning period.

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