



Growth performance of Large White Yorkshire pigs on supplementation of Jaggery filter cake in finisher stage

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Received: 26 September 2018; Accepted: 28 March 2019

Key words: Body weight, Finisher, Growth, Jaggery filter cake, Pig

Many attempts have been made to explore different unconventional feed as feeding pig is the major cost in the pork industry. Many researchers (Campos *et al.* 2006 and Sikka 2007) have tried to replace the maize with molasses. Jaggery filter cake (JFC) is nothing but scum obtained while making Jaggery (Patel *et al.* 2009). On perusal of literature we have found few references on feeding of sugarcane filter cake/press mud in different livestock (Suma *et al.* 2007; Suresh *et al.* 2012; Sahu *et al.* 2016; Kumar *et al.* 2017). However, no literature on any scientific study is available on this traditional practice. Therefore, by keeping the importance of Jaggery filter cake in economic pig farming in developing countries, a study was conducted on the performance of finisher Large White Yorkshire fed on different level of Jaggery filter cake along with balanced diet.

The present investigation was conducted at Swine Production Unit, College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. The place is located in the foothills of Himalayas at 29.5°N latitude, 79.3°E longitude and an altitude of 243.84 m above Mean Sea Level. Twenty four growers (5 month old) were divided into 4 dietary treatment groups maintaining similar male:female ratio (3+3), viz. Group 1: concentrate only, Group 2: concentrate + 700 g JFC, Group 3: concentrate + 1,400 g JFC, Group 4 and concentrate + 2,100 g JFC. Jaggery filter cake supplementation was increased every week in the ratio of 0:50:100:150 g in group 1, 2, 3, 4 respectively

Animals were housed in individual well ventilated shed under corrugated asbestos sheeting roof on cement concrete floor with a floor space allowance of 2×3 m² per individual. Pen was cleaned and washed with water twice daily. Proper hygienic conditions including healthy surroundings were

maintained in the shed throughout the experimental trial. All the piglets were de-wormed 15 day before the start of the experiment with Albendazole. All animals were vaccinated against swine fever (BP Division, IVRI).

Ration was prepared at the experimental site. The percentage of maize, soybean meal, wheat bran, fish meal, mineral mixture, common salt, vitamin (A, D, E, K) and vitamin B complex in finisher ration was 60, 12.5, 20, 5, 2, 0.5% and 25 g respectively. The grower ration was continued for 9 weeks (nearly up to 35 kg body weight). The fresh Jaggery filter cake was procured from local area on daily basis. However, required portion of fresh Jaggery filter cake was fed before feeding the concentrate.

The parameters like feed intake and gain were recorded. Daily voluntary feed intakes of each animal were noted. Weighed quantity of feed was offered daily in two divided portions twice (once in the morning at 10:00 AM and also in the evening 4:00 PM). The residues were collected and weighed at 2:00 PM same day and 9:30 AM on next day in all the groups, respectively. The dry matter of jaggery filter cake and concentrate was clubbed. Body weight changes of animals in each treatment group were recorded in the morning before feeding at weekly intervals. Recording of body weights of growers were made on a platform balance of 300 kg capacity with a least count of 50 g.

The data were analyzed using Analysis of Variance (ANOVA) and the Critical Difference (CD) was calculated to determine any significant differences among the treatment means (Snedecor and Cochran, 1994).

Table 1. represents the mean ± S.E. of daily dry matter intake (kg) of finisher pigs. Results revealed that there was highest DM intake in group 4 compared to all other treatment groups. However, most of the DM values in group 4 differed significantly from group 1 and group 2 up to 5th week. The overall daily DM intake (kg) during growing stage was 1.88±0.05, 1.97±0.07, 2.01±0.07 and 2.12±0.06 in group 1, 2, 3 and 4 respectively. The lowest and highest dry matter intake was observed in group 1 and group 4 respectively and values differed significantly (P<0.01). However, there was no significant difference between groups 2 and 3 at the end of the experiment.

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Table 1. Average daily dry matter intake (kg) of finishers

Week	1	2	3	4	Significance
1 st	1.68 ^a ± 0.01	1.72 ^a ± 0.04	1.74 ^a ± 0.03	1.90 ^b ± 0.05	**
2 nd	1.79 ^a ± 0.03	1.82 ^a ± 0.03	1.95 ^b ± 0.03	2.00 ^b ± 0.06	**
3 rd	1.81 ^a ± 0.03	1.85 ^a ± 0.04	1.89 ^a ± 0.03	2.07 ^b ± 0.04	**
4 th	1.890 ^a ± 0.03	1.97 ^a ± 0.07	1.97 ^{ab} ± 0.06	2.10 ^b ± 0.08	**
5 th	2.07± 0.06	2.13± 0.12	2.16± 0.01	2.27± 0.09	ns
6 th	2.02 ^a ± 0.07	2.17 ^{ab} ± 0.09	2.22 ^{ab} ± 0.07	2.24 ^b ± 0.09	**
7 th	1.88 ^a ± 0.05	2.15 ^b ± 0.11	2.16 ^b ± 0.08	2.28 ^b ± 0.13	**
Overall Mean	1.88 ^a ± 0.05	1.97 ^{ab} ± 0.07	2.01 ^{ab} ± 0.07	2.12 ^b ± 0.06	**

Means bearing different superscripts in a row differ significantly from each other (**P<0.01; *P<0.05).

This is in agreement with Suresh (2007), who reported that feed consumption was moderately affected by incorporation of Sugarcane Press Residue (SPR) at 5% and substantially at 10% level. More DM intake in group 4 might be due to more intake of JFC along with concentrate. A preliminary trial on magnitude of utilization of SPR in broiler birds (up to 4%) showed that SPR can be valuable non-conventional feedstuffs for poultry (Budeppa *et al.* 2008). Another trial conducted in laying hens also revealed that there is a potential for use of SPR up to 10% as a source of both organic and inorganic nutrients in layer rations (Suma *et al.* 2007). In growing sheep, Suresh *et al.* (2012) demonstrated that SPR can serve as a valuable ingredient in the concentrate for stall fed sheep up to 3%.

The mean ± S.E. of weekly concentrate balanced ration intake (kg) of finisher has been presented in Table 2. The daily concentrate intake was found to be highest in group 1 followed by group 2, 3 and 4. The same trend was followed during whole experimental period. Table reveals that the daily concentrate intake was increased gradually with advancement of age in all the treatment groups, except for seventh week, where daily concentrate intake was reduced than the previous week. This might be due to due to relatively higher ambient temperature during last week of March. Group 4 showed a highly significant (P<0.01) difference in daily concentrate intake from group 1 during whole experiment with few expectations. Therefore, supplementation of JFC reduced the concentrate intake.

Table 3 represents the mean ± S.E. of weekly change in body weight (kg) of growers during experimental trial. During 0 day of the experiment, the mean ± S.E. of body weight of different treatment groups was almost similar which ranged from 37.63 ± 1.13 kg to 40.38 ± 1.55 kg. The body weight increased with advancement of age. The body weight of group 4 differed significantly (P<0.01) from 2nd week onwards till end of the experiment except third week.

Table 2. Weekly concentrate intake (kg) of finishers

Week	1	2	3	4	Significance
1 st	1.68± 0.01	1.59± 0.04	1.47± 0.03	1.73± 0.21	ns
2 nd	1.79 ^a ± 0.03	1.67 ^b ± 0.03	1.65 ^{bc} ± 0.03	1.55 ^c ± 0.06	**
3 rd	1.81 ^a ± 0.03	1.71 ^a ± 0.05	1.56 ^b ± 0.03	1.58 ^b ± 0.04	**
4 th	1.89 ^a ± 0.03	1.79 ^{ab} ± 0.07	1.61 ^{bc} ± 0.05	1.56 ^c ± 0.08	**
5 th	2.07 ^a ± 0.06	1.93 ^{ab} ± 0.12	1.77 ^b ± 0.10	1.68 ^b ± 0.09	*
6 th	2.02 ^a ± 0.07	1.96 ^a ± 0.09	1.80 ^{ab} ± 0.07	1.61 ^b ± 0.09	*
7 th	1.88 ^a ± 0.05	1.93 ^a ± 0.11	1.71 ^{ab} ± 0.08	1.61 ^b ± 0.13	**
Overall Mean	1.88 ^a ± 0.05	1.80 ^a ± 0.06	1.65 ^b ± 0.05	1.62 ^b ± 0.03	**

Means bearing different superscripts in a row differ significantly from each other (**P<0.01; *P<0.05).

At the end, group 4 showed highest body weight gain followed by group 2, 3 and 1. Further, body weight in group 4 differed significantly (P<0.01) only with group 1 indicating JFC supplementation improved the body weight gains proportionately in all groups.

Table 4 represents mean ± S.E. of daily weight gain (kg) of finisher during entire experimental period. The overall weight gain (kg) in group 1, 2, 3 and 4 was 645.41 ± 17.23, 677.72 ± 22.59, 689.63 ± 27.35 and 702.38 ± 28.43 respectively during finisher stage. From table it can be concluded that during finisher stage supplementation of JFC along with concentrate increased the weight gain. This is in agreement with the results of Straub and Darne (1965) who conducted an experiment using either scums, scums/molasses/fish meal (50/35/15) or a standard cow feed and

Table 3. Average weekly body weight change (kg) of finishers

Week	1	2	3	4	Significance
0	37.63± 1.13	39.83± 0.74	39.13± 0.83	40.38± 1.55	ns
1 st	41.63± 0.10	43.96± 0.78	43.17± 0.86	44.54± 1.58	ns
2 nd	45.92 ^a ± 0.97	48.42 ^{ab} ± 0.79	47.71 ^{ab} ± 0.92	49.04 ^b ± 1.57	**
3 rd	50.38± 1.10	52.88± 0.88	52.21± 0.98	53.58± 1.68	ns
4 th	54.83 ^a ± 1.072	57.63 ^{ab} ± 0.97	57.00 ^{ab} ± 1.09	58.58 ^b ± 1.73	**
5 th	59.59 ^a ± 1.21	62.71 ^{ab} ± 1.06	62.21 ^{ab} ± 1.22	63.79 ^b ± 1.89	**
6 th	64.54 ^a ± 1.39	67.75 ^{ab} ± 1.07	67.38 ^{ab} ± 1.18	69.21 ^b ± 2.05	**
7 th	69.25 ^a ± 1.41	73.04 ^{ab} ± 0.99	72.92 ^{ab} ± 1.27	74.79 ^b ± 2.10	**

Means bearing different superscripts in a row differ significantly from each other (**P<0.01; *P<0.05).

found average results with respect to milk productivity. There was significant increase in the ADG during last week in the group 4 in comparison to group 1.

Weekly FCR (mean $\pm$ S.E.) of pigs during finishing stage is furnished in Table 5. The overall FCR during growing stage was 2.96 ± 0.04 , 2.93 ± 0.02 , 2.95 ± 0.04 and 3.05 ± 0.05 in group 1, 2, 3 and 4 respectively. From table it can be concluded that during finisher stage supplementation of JFC along with concentrate decreased the FCR values indicating good utilization of nutrient. However, FCR values did not differ significantly between treatment groups during entire experiment. Results indicate that on supplementation of JFC did not cause any adverse effect on FCR. Suresh *et al*

Table 4. Average daily weight gain (g) of finishers

Week	1	2	3	4	Significance
1 st	571.43 $\pm$ 33.25	589.29 $\pm$ 23.96	583.33 $\pm$ 15.06	595.24 $\pm$ 11.90	ns
2 nd	613.10 $\pm$ 21.46	636.90 $\pm$ 10.98	642.85 $\pm$ 22.588	642.86 $\pm$ 22.59	ns
3 rd	636.90 $\pm$ 29.76	636.90 $\pm$ 14.34	642.86 $\pm$ 20.62	648.81 $\pm$ 23.36	ns
4 th	636.90 $\pm$ 43.66	678.57 $\pm$ 30.58	684.52 $\pm$ 28.30	714.29 $\pm$ 20.62	ns
5 th	678.57 $\pm$ 44.22	726.19 $\pm$ 27.15	744.05 $\pm$ 43.66	744.05 $\pm$ 46.49	ns
6 th	708.33 $\pm$ 48.28	720.24 $\pm$ 32.49	738.09 $\pm$ 27.15	773.81 $\pm$ 32.82	ns
7 th	672.62 ^a $\pm$ 26.75	755.95 ^{ab} $\pm$ 47.40	791.67 ^b $\pm$ 28.30	797.62 ^b $\pm$ 15.06	**
Overall Mean	645.41 $\pm$ 17.23	677.72 $\pm$ 22.59	689.63 $\pm$ 27.35	702.38 $\pm$ 28.43	ns

Means bearing different superscripts in a row differ significantly from each other (** $P < 0.01$; * $P < 0.05$).

al. (2012) conducted a trial, where SPR was evaluated at 1, 2 and 3% of concentrate mixtures which were offered to meet 50% dry matter requirement of lambs, demonstrated that the feed conversion ratio were uniform among different treatment groups including that of the control (0% SPR) group. Inclusion of JFC had improved the FCR in pigs which is supported by similar work by Budeppa *et al.* (2008) in poultry.

SUMMARY

The present study was conducted on 24 growers which were divided into 4 dietary treatment groups, viz. Group 1: concentrate only, Group 2: concentrate +700 g JFC, Group 3: concentrate + 1,400 g JFC, Group 4 and concentrate + 2,100 g JFC. Jaggery filter cake supplementation was increased every week in the ratio of 0:50:100:150 g in group 1, 2, 3, 4 respectively. Lowest and highest dry matter intake was observed in group 1 and group 4 respectively and values differed significantly ($P < 0.01$). At the end of finisher stage, group 4 showed highest body weight followed by group 2, 3 and 1. The overall FCR during growing stage was 2.96 ± 0.04 , 2.93 ± 0.02 , 2.95 ± 0.04 and 3.05 ± 0.05 in group 1, 2,

Table 5. Average weekly Feed Conversion Ratio of finishers

Week	1	2	3	4	Significance
1 st	2.99 $\pm$ 0.18	2.95 $\pm$ 0.15	2.98 $\pm$ 0.08	3.19 $\pm$ 0.06	ns
2 nd	2.94 $\pm$ 0.09	2.87 $\pm$ 0.09	3.05 $\pm$ 0.09	3.12 $\pm$ 0.10	ns
3 rd	2.87 $\pm$ 0.12	2.91 $\pm$ 0.11	2.96 $\pm$ 0.14	3.21 $\pm$ 0.11	ns
4 th	3.04 $\pm$ 0.21	2.93 $\pm$ 0.18	2.93 $\pm$ 0.21	2.96 $\pm$ 0.15	ns
5 th	3.13 $\pm$ 0.24	2.95 $\pm$ 0.20	2.96 $\pm$ 0.22	3.08 $\pm$ 0.11	ns
6 th	2.91 $\pm$ 0.21	3.06 $\pm$ 0.21	3.019 $\pm$ 0.06	2.90 $\pm$ 0.10	ns
7 th	2.82 $\pm$ 0.13	2.88 $\pm$ 0.15	2.75 $\pm$ 0.17	2.87 $\pm$ 0.18	ns
Overall Mean	2.96 $\pm$ 0.04	2.93 $\pm$ 0.02	2.95 $\pm$ 0.04	3.05 $\pm$ 0.05	ns

Means bearing different superscripts in a row differ significantly from each other (** $P < 0.01$; * $P < 0.05$).

3 and 4 respectively. It can be concluded that Jaggery Filter cake can be fed to finisher pigs starting with 2,100 g and increment of 150 g in the subsequent weekly interval for optimal growth rates.

ACKNOWLEDGEMENTS

The authors are thankful to DBT, New Delhi for financial help and Dean, CVASc for extending facility to carry out this work.

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