STUDIES ON FEEDING GREEN BERSEEM (*Trifolium alexandrinum*) ON GROWTH PERFORMANCE AND ECONOMICS OF FINISHER PIGS RAISED ON KITCHEN WASTE BASED DIET

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ABSTRACT

Present experiment was designed to study performance of large white yorkshire pigs of the age of about 5 months by feeding kitchen waste based diet. Animals were segregated and kept in 4 different groups comprising of 6 animals in each category. Each group received feed as follows, group I : 10% green berseem + 50% kitchen waste + 40% concentrate; Group II: 15% green berseem + 50% kitchen waste + 35% concentrate; Group III: 20% green berseem + 50% kitchen waste + 30% concentrate and group IV: 25% green berseem + 50% kitchen waste + 25% concentrate. The feeding trial was conducted for two months duration with green berseem and concentrate with variable ratio while kitchen waste was kept constant. Dry matter intake was found significantly (P<0.01) higher in group I and no significant differences were observed among group II, III and IV. With respect to parameter of overall bodyweight gain difference was not significant during finishing stage of experimental animals. But in Group I animals the last fortnight period had shown significant (P<0.05) change in bodyweight gain. Further, daily weight gain was found significant in Group I animals and it was not noticed in other groups. Concentrate substitution for 50% kitchen waste along with different levels of green berseem decreased feed conversion ratio. But these differences were not found significant among experimental groups. Significant (P<0.01) difference in cost of total feed intake and cost per kg live weight gain were observed and was found highest in Group I followed by Group II, III and IV. The study also noticed that no significant difference between group II and III.
1 Introduction

Livestock production systems in India are mainly based on low cost agro by products as nutritional input through traditional technologies or practices. This augurs well in pig production system as agro-industrial byproducts unfit for human consumption or forages can be nutritional source for these livestock. However, cost of feed accounts as high as 70-75 percent of total expenditure in pig farming (ICAR, 2002). Hence, any endeavour for lowering production cost in pig farming is paramount, with emphasize on economic feasibility of feed as being the single cost factor. It is also felt not only to optimize growth of animals by providing them with diets of optimum quality but with maximum economic return for smallholder livestock producers. Accordingly, present research was planned to observe effect of kitchen wastes and green pasture, in place of concentrate to the extent feasible in pig ration without adversely affecting performance.

2 Materials and Methods

Present investigation was conducted at Swine Production Unit, Department of Livestock Production and Management, College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture & Technology, Pantnagar during the year 2010. Experiment was designed using 24 piglets of about 5 months age. Animals were randomly selected and kept in 4 groups (T1, T2, T3 and T4) of 6 animals each. The experimentation was conducted for a period of two months. Distributions of feed in different such groups have been presented as follows, Group I: 10% green berseem + 50% kitchen waste + 40% concentrate; Group II: 15% green berseem + 50% kitchen waste + 45% concentrate; Group III: 20% green berseem + 50% kitchen waste + 35% concentrate and Group IV: 25% green berseem + 50% kitchen waste + 25% concentrate. Green berseem and concentrate was variable while kitchen waste was kept constant in the study. The ad libitum feeding was done during experiment. The voluntary feed intake of each animal was recorded daily. Change in body weight was recorded in the morning before feeding at every fortnight interval by using standard balance. The green Berseem (Trifolium alexandrium) required for research work was harvested, chopped and allowed wilting for overnight before feeding. The kitchen waste was collected from hostel mess in fresh form. Thereafter, it was thoroughly mixed to make it uniform in its contents.

The cost of balanced ration, green berseem and kitchen waste was calculated by including transportation cost from production unit to experimental site. The relative cost effectiveness of each diet was assessed accordingly. By considering total live weight gain under each treatment, the cost involved to produce 1 kg live weight gain was calculated. Net profit for each treatment was calculated separately by considering sale price of pork produced at the end of experiment. The data were analyzed using Analysis of Variance (ANOVA) and the Critical Difference (CD) to determine any significant difference among the treatment means (Snedecor & Cochran, 1994).

3 Results and Discussion

The chemical composition of feed ingredients and proximate composition (% on DM basis) of experimental diets were presented in Table 1 & 2, respectively. The dry matter, organic matter, ether extract and nitrogen free extract was found highest for group I followed by group II, III and IV. However, total ash, crude protein and crude fibre was found highest for group IV followed by group III, II and I.

The average daily dry matter intake (kg) in finisher pigs is presented in Table 3. The overall daily DM intake during finishing stage was 3.14 ± 0.04, 2.20 ± 0.03, 2.18 ± 0.04 and 2.12 ± 0.04 kg respectively, in groups I, II, III and IV. Significantly (P<0.01) highest overall DM intake during finishing stage was found in group I followed by group II, III and IV. However, no significant differences were observed among group II, III and IV. During 1st to last week (8%) of the finishing stage significant (P<0.01) difference were observed among groups. During entire finishing stage significantly highest DM intake was observed for group I followed by group II, III and IV. However no significant differences were observed among later three groups in most of the period.

Table 1 Chemical composition of in concentrate mixture, kitchen waste and green berseem (% on DM basis).

| Constituent                   | Concentrate mixture | Kitchen waste | Green berseem |
|-------------------------------|---------------------|---------------|---------------|
| Dry matter                    | 90.17±0.56          | 29.67±3.52    | 14.20±0.85    |
| Organic matter                | 90.69 ± 0.73        | 95.80 ± 0.86  | 85.09±0.36    |
| Crude protein                 | 20.00 ± 1.01        | 19.07 ± 0.58  | 21.68±2.29    |
| Crude fibre                   | 3.20 ± 1.63         | 2.39 ± 1.38   | 18.69±0.86    |
| Ether extract                 | 3.59 ± 0.53         | 12.68 ± 0.92  | 2.82±0.66     |
| Nitrogen free extract         | 63.90 ± 1.87        | 61.66 ± 2.41  | 41.90±1.43    |
| Total ash                     | 9.31 ± 0.73         | 4.20 ± 0.86   | 14.91±0.84    |

The experimental site. The relative cost effectiveness of each diet was assessed accordingly. By considering total live weight gain under each treatment, the cost involved to produce 1 kg live weight gain was calculated. Net profit for each treatment was calculated separately by considering sale price of pork produced at the end of experiment. The data were analyzed using Analysis of Variance (ANOVA) and the Critical Difference (CD) to determine any significant difference among the treatment means (Snedecor & Cochran, 1994).
Table 2  Proximate composition (% on DM basis) of experimental diet.

| Constituents      | Groups/Treatments |
|-------------------|-------------------|
|                   | I                 | II                | III               | IV                |
| Dry matter        | 52.32             | 48.52             | 44.73             | 40.93             |
| Organic matter    | 92.69             | 92.41             | 92.13             | 91.85             |
| Total ash         | 7.32              | 7.59              | 7.88              | 8.16              |
| Crude protein     | 19.63             | 19.71             | 19.80             | 19.88             |
| Crude fibre       | 4.34              | 5.12              | 5.89              | 6.67              |
| Ether extract     | 8.06              | 8.02              | 7.98              | 7.94              |
| Nitrogen free extract | 60.58              | 59.48             | 58.38             | 57.28             |

Table 3  Effect of different treatments on daily dry matter intake (kg) of finisher pigs.

| Groups/Treatments |
|-------------------|
| Week              | I              | II              | III             | IV              |
| 1st               | 2.97±0.07*     | 2.31±0.08*     | 2.38±0.05b     | 2.29±0.05b     | **             |
| 2nd               | 3.12±0.08*     | 2.21±0.08      | 2.26±0.04b     | 2.19±0.06b     | **             |
| 3rd               | 3.24±0.17*     | 2.27±0.07b     | 2.27±0.06b     | 2.22±0.05b     | **             |
| 4th               | 3.30±0.17*     | 2.13±0.07b     | 2.07±0.05b     | 2.14±0.05b     | **             |
| 5th               | 3.13±0.14*     | 2.05±0.06b     | 2.04±0.03b     | 2.01±0.04b     | **             |
| 6th               | 3.08±0.17*     | 2.10±0.06b     | 2.10±0.03b     | 2.04±0.04b     | **             |
| 7th               | 3.09±0.13t     | 2.21±0.06b     | 2.10±0.03b     | 2.00±0.05b     | **             |
| 8th               | 3.15±0.12*     | 2.30±0.06b     | 2.18±0.03bc    | 2.07±0.05c     | **             |
| Overall Mean      | 3.14±0.04t     | 2.20±0.03b     | 2.18±0.04b     | 2.12±0.04b     | **             |

Mean±S.E. Means bearing different superscripts in a row differ significantly from each other (**P<0.01)

Table 4  Effect of different treatments on fortnightly body weight change (kg) of finisher pigs.

| Groups/Treatments |
|-------------------|
| Fortnight         | I              | II              | III             | IV              |
| 0                 | 43.75±1.78     | 45.58±2.19      | 45.33±1.13      | 47.50±1.52      | NS             |
| 1st               | 54.33±2.11     | 53.92±1.97      | 53.00±0.93      | 56.17±1.42      | NS             |
| 2nd               | 63.08±2.22     | 62.50±2.24      | 60.58±0.38      | 65.42±1.41      | NS             |
| 3rd               | 74.08±2.84     | 70.50±2.36      | 68.83±0.54      | 73.42±1.34      | NS             |
| 4th               | 85.25±2.74     | 78.58±2.32      | 77.08±0.58c     | 80.92±1.43m     | *              |
| Overall Mean      | 64.10±7.27     | 62.22±5.84      | 60.96±5.61      | 64.69±5.95      | NS             |

Mean±S.E. Means bearing different superscripts in a row differ significantly from each other (**P<0.01)

Table 5  Effect of different treatments on daily body weight gain (g) of finisher pigs.

| Groups/Treatments |
|-------------------|
| Fortnight         | I              | II              | III             | IV              |
| 1st               | 755.95±38.48*  | 595.24±34.09b   | 583.33±56.59b   | 619.05±17.66b   | *              |
| 2nd               | 625.00±17.86   | 613.10±38.48    | 541.67±45.57    | 660.72±12.20    | NS             |
| 3rd               | 785.71±52.16c  | 751.43±39.12b   | 589.26±56.66b   | 571.43±27.66b   | **             |
| 4th               | 797.62±38.76c  | 757.38±31.16b   | 589.29±34.19b   | 535.71±15.97m   | **             |
| Overall Mean      | 741.07±39.67t  | 589.29±49.41b   | 575.89±11.49b   | 596.73±27.32b   | **             |

Mean±SE, Means bearing different superscripts in a row differ significantly from each other (**P<0.01, *P<0.05), NS= Non-significant

The mean fortnightly changes in body weight (kg) of finishers pig during experimental feeding trial were presented in Table 4. At the end of finishing stage group I showed highest body weight gain followed by groups IV, II and III. It was observed that during first three fortnights, body weight gain did not differ significantly among experimental animals. However, only in Group I, significant (P<0.05) bodyweight gain was noticed in last fortnight [Fourth] period. The other groups viz., II, III, IV did not show any significant difference in body weight gain.
The findings of the present study corroborated with the results of Yadav et al. (1993), Silva et al. (2005) and Phiny et al. (2010) who conducted experiment in pigs using mulberry leaves, grass and fodder radish (Raphanus sativus L.) respectively. Results were also in agreement with Sinha et al. (1992).

Table 6: Effect of different treatments on fortnightly Feed Conversion Ratio of finisher pigs.

| Fortnight | Groups/Treatments | I         | II         | III        | IV         | Significance |
|-----------|-------------------|-----------|-----------|-----------|-----------|-------------|
| 1<sup>st</sup> | 4.06±0.17         | 3.89±0.32 | 4.58±0.12 | 3.52±0.12 | NS        |
| 2<sup>nd</sup> | 4.27±0.21         | 3.69±0.34 | 4.14±0.33 | 3.30±0.09 | NS        |
| 3<sup>rd</sup> | 3.49±0.28         | 3.74±0.33 | 3.75±0.49 | 3.54±0.23 | NS        |
| 4<sup>th</sup> | 3.95±0.20         | 3.96±0.24 | 3.68±0.20 | 3.82±0.17 | NS        |
| Overall Mean | 3.94±0.17         | 3.82±0.06 | 4.04±0.21 | 3.55±0.11 | NS        |

Mean±SE, Means bearing different superscripts in a row differ significantly from each other (*P<0.05), NS= Non-significant

Table 7: Relative economics of finisher pigs under different treatments.

| Particulars | Groups/Treatments | I         | II         | III        | IV         | Significance |
|-------------|-------------------|-----------|-----------|-----------|-----------|-------------|
| Cost of total Concentrate feed intake (Rs.) | 820.82±24.29<sup>a</sup> | 516.82±8.36<sup>b</sup> | 447.83±2.92<sup>c</sup> | 358.73±7.84<sup>d</sup> | **    |
| Cost of total kitchen waste intake (Rs.) | 152.17±5.41<sup>a</sup> | 110.81±2.10<sup>b</sup> | 109.15±1.31<sup>c</sup> | 107.32±2.57<sup>d</sup> | **    |
| Cost of total berseem intake (Rs.) | 85.18±2.19<sup>a</sup> | 96.14±2.52<sup>b</sup> | 131.46±1.70<sup>c</sup> | 165.46±3.18<sup>d</sup> | **    |
| Cost of total feed intake (Rs.) | 1058.17±31.56<sup>a</sup> | 723.76±12.25<sup>b</sup> | 688.44±4.92<sup>c</sup> | 631.50±13.39<sup>d</sup> | **    |
| Total body weight gain (Kg) | 41.50±1.60<sup>a</sup> | 33.00±1.20<sup>b</sup> | 31.75±1.31<sup>c</sup> | 33.42±0.76<sup>d</sup> | **    |
| Cost per kg live weight gain (Rs./kg) | 25.65±1.05<sup>a</sup> | 22.03±0.60<sup>b</sup> | 21.86±0.88<sup>c</sup> | 18.95±0.60<sup>d</sup> | **    |

Means bearing different superscripts in a row differ significantly from each other (***P<0.01)
Table 7 represents relative economics for rearing pigs using different levels of green berseem along with concentrate and fixed level of kitchen waste. Significantly (p<0.01) highest cost of balanced ration was observed for group I (820.82 ± 24.29) followed by group II (516.82 ± 8.36), III (447.83 ± 2.92) and group IV (358.73 ± 7.84), which differ significantly among each other. The cost involved in feeding kitchen waste for group I, II, III and IV was Rs. 152.17 ± 5.41, 110.81 ± 2.10, 109.15 ± 1.31 and 107.32 ± 2.57 respectively, significantly (p<0.01) highest value was observed for group I, however no significant difference were observed among groups II, III and IV. The cost of feeding green berseem was found less in Group I (Rs. 85.18 ± 2.19) and highest in Group IV (Rs. 165.46 ± 3.18). In all these groups, this parameter differed significantly in this experimental study.

The total cost of feeding during the whole experiment was significantly (P<0.01) highest in group I (Rs. 1058.17), followed by group II (Rs. 723.76), group III (Rs. 688.44) and lowest in group IV (Rs. 631.50). Cost involved for production of 1 kg live weight for group I to IV was Rs. 25.65, Rs. 22.03, Rs. 21.86 and Rs. 18.95 respectively, which differ significantly (P<0.01) among groups but non-significant between group II and III. The highest cost per kg live weight gain in group I was due to highest dry matter and maximum concentrate intake. Non-significant but higher cost involved in group II as compared to group III due to relatively more concentrate intake. Provision of green berseem along with kitchen waste and balanced ration decreased the cost per kg live weight gain.

**Conclusion**

The result demonstrated a clear advantage of replacement of concentrate with green berseem and kitchen waste both in rate and economy of weight gain in respect of profit per kg of pork production. Thus it may be concluded that, Green berseem could be incorporated upto 25% of total dry matter intake without affecting performance of pigs adversely.

**Conflict of interest**

Authors would hereby like to declare that there is no conflict of interests that could possibly arise.

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