Reproductive and productive performances of crossbred Andaman local pigs under small holder production system at Bay Islands, India

M.S. Kundu*, Jai Sunder, A. Kundu, Arun Kumar De and T. Sujatha

Division of Animal Science, Central Island Agricultural Research Institute, Port Blair-744 101, Andaman and Nicobar Islands, India.
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ABSTRACT

The present study appraises different traditional feeding practices followed by farmers and effect of dietary zinc supplementation on the reproductive and productive performances of crossbred Andaman local pigs. In the 1st experiment the effect of three feeding practices were evaluated and in the 2nd experiment the effect of supplementation of 80 ppm Zn on growth of weanling piglets were evaluated. The locally available feed ingredients like rice bran, taro (Colocasia esculenta) leaves, broken rice, broken wheat, maize, and coconut cake were used in different proportion for feeding. The different reproductive parameters like the mean age at puberty, age at first conception and first farrowing and various litter traits varied significantly (<0.01) among the three treatment groups. In the next experiment the effect of Zn supplementation on post weaning growth performances of piglets were studied. In treatment group (n=5) 80 ppm Zn was supplemented along with normal farm diet where as in control group (n=5) normal diet was given. The experiment continued for three months. The results showed that the sow receiving the ration made up of coconut cake, broken rice or maize performed better than the sow receiving ration made up of colocasia leaves and rice bran in respect of reproductive performances. Similarly, inclusion of 80 ppm Zn in stater ration enhanced the daily body weight.

Key words: Colocasia, Growth performances, Pig, Reproduction of pig, Small holder pig production, Zinc.

INTRODUCTION

Small holder pig production has great potential to support the livelihood of small and marginal farmers and improved their livelihood. Villagers generally rear few numbers of livestock including poultry which is supplementary to their traditional agricultural practices. The size of the flock always maintain as per the available resources as well as the family workforce to look after the livestock and poultry. Feed and fodder accounts for about 70 per cent of the expenditure for rearing the livestock and poultry. Conventional feed and fodder are costly, also not readily available in the remote areas. Farmers particularly the farm women take the advantage of naturally occurring feed (e.g Colocasia leaves and petioles, pseudo stem of banana, cassava leaves and other green plants) collected from their surroundings, fallow fields and forests (Gansberghem 2005) to rear the pigs. These reduce the cost of production as well as keep the farm women a productive engagement for their pigs.

Among the different indigenous naturally occurring feed ingredients used for pig feeding in Andaman and Nicobar Islands, taro (Colocasia esculenta) is very common. It is an ancient crop and available in large quantity in this Islands. Its nutritional value is comparable to potato (Wang 1983). The leaves and petioles contain about 23% protein on a dry weight basis (Tumuhimbise et al. 2009). It is also a rich source of micronutrients (Onwueme 1999, Ndon et al. 2003). The leaves and petioles are widely used for pig feeding in the tropics. Feeding fresh taro leaves and stem to the pig showed the poorest result, with intermediate values for processing by cooking, reported by Toan and Preston (2010) in Vietnam.

Pigs constitute 27.26 % of the total livestock (cattle, goat and pig) populations of Andaman and Nicobar Islands (Kundu et al. 2010). It is being reared mostly by tribes and settlers and distributed in different islands of Andaman and Nicobar groups. There are four different genetic groups of pigs available in these Islands (De et al. 2013). The pigs are generally reared under free range and/ or semi intensive system. The pigs are fed with locally available feed materials, viz. rice bran, maize, wheat, coconut, taro (Colocasia esculenta and Colocasia antiquorum), tapioca, kitchen/ hotel waste, vegetable waste and poultry offal (Jeyakumar et al. 2012).

There is a huge shortage of animal feed and fodder and this is the main constraint to the development of piggery sector in these islands as imported feed are very expensive. No information is available regarding suitability of these feeding practices for the growth and reproductive parameters of the pigs. In general feed, fodder and soil of these Islands...
are deficient in minerals particularly Zn and is limiting factor for the growth of the pig. Therefore, the current study focused to evaluate the effect of different feeding practices followed by the farmers and selected the best practices followed under traditional system to get best performance. It also evaluated the effect of Zn supplementation on the growth of weaned piglets.

MATERIALS AND METHODS
The present experiments comply with all relevant institutional and national animal welfare guidelines. The crosses of Andaman local pigs (LWY X Andaman local) developed at CIARI and distributed among farmers were used in these experiments.

Effect of different feeding practices on reproductive and productive parameters: A total number of 16 gilts of 5 months old were randomly divided into 3 groups; 5 in first two groups and 6 in third one. The three groups were fortified with three different indigenous rations (Control, farmers practice 1 and farmers practice 2), the compositions of which are presented in Table 1. The experiment was continued till all the gilts farrowed and subsequent weaning of the newborn. Different reproductive parameters like age at puberty (days), age at first conception (days), age at first farrowing (days), and various litter traits like litter size at birth (Nos), total litter weight at birth (kg), individual litter weight at birth (kg), litter size at weaning (Nos), litter weight at weaning (kg), individual litter weight at weaning (kg) and weaning percentage were recorded and evaluated.

Effect of Zn supplementation on reproductive and productive parameters: Ten piglets were randomly allotted to two different groups each of 5 piglets. The mean body weight of piglets was 07.28 ± 0.23 kg and 07.10 ± 0.25 kg respectively, for the two groups. Group 1 (Control) was fed with the basal diet (farmers’ practice). Group 2 (Treatment 1) received basal diet supplemented with 80 ppm Zn as Zinc sulphate. The experiment was continued for 3 months. The fortnightly body weight gain (kg), total weight gain (kg) and average daily gain (g/day) were calculated. Data were subjected to test of significance as per Snedecor and Cochran (1994).

RESULTS AND DISCUSSION
Effect of different feeding practices on reproductive and productive parameters: The mean values of different reproductive parameters under different categories of feeding presented in Table 2. The age at puberty, age at first conception and age at first farrowing was found significantly (P<0.01) reduced in control as well as T1 groups than T2. No significant differences among different groups were found in respect of litter performances except weaning litter size and litter percentage where significantly higher (P<0.01) values were found in control and T1 than T2.

Effect of Zn supplementation on growth performances: The fortnightly body weight gain (kg), total weight gain (kg) and the average daily weight gains (ADWG) were recorded for both the supplemented and control group and finding are presented in Table 3. Significantly higher (P<0.01) ADWG was recorded in the supplemented group from 45th day of supplementation than the un-supplemented group. The overall ADWG was significantly higher (P<0.01) in supplemented group than the control.

Reproductive performances: Several reports (De et al. 2014; Nath et al. 2013; Phengsavanh et al. 2010; Kumarason et al. 2016) showed that supplementation of Zn in the feed could improve the reproductive performances of pigs. The present study also supported the previous findings. The higher reproductive performances observed in the supplemented group could be due to the increased Zn level in the plasma. Several reports (De et al. 2014; Nath et al. 2013; Phengsavanh et al. 2010; Kumarason et al. 2016) showed that supplementation of Zn in the feed could improve the reproductive performances of pigs. The present study also supported the previous findings. The higher reproductive performances observed in the supplemented group could be due to the increased Zn level in the plasma.

Table 1: Composition of ration

<table>
<thead>
<tr>
<th>Treatments (n)</th>
<th>Ration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (5)</td>
<td>Rice bran (16.67%) + Colocasia leaves (33.33%) + Maize/wheat (33.33%) + Coconut cake (16.67%)</td>
</tr>
<tr>
<td>Framer’s practice 1 (5)</td>
<td>(Rice bran (40%) + (Colocasia leaves 40%) + 300 g broken rice/wheat (20%)</td>
</tr>
<tr>
<td>Framer’s practice 2 (6)</td>
<td>Rice bran (50%) + Colocasia leaves (50%)</td>
</tr>
</tbody>
</table>

Percentage of inclusion is on dry matter basis

Table 2: Reproductive traits of pigs (Large White Yorkshire x Andaman local) under different types of feeding

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Farmers’ Practice 1 (T-1)</th>
<th>Farmers’ Practice 2 (T-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at puberty (days)</td>
<td>221.67 ± 3.99</td>
<td>260.00 ± 4.76</td>
<td>299.6 ± 6.11</td>
</tr>
<tr>
<td>Age at first conception (days)</td>
<td>245.50 ± 3.94</td>
<td>292.40 ± 6.60</td>
<td>340.2 ± 7.42</td>
</tr>
<tr>
<td>Age at first farrowing (days)</td>
<td>357.00 ± 4.07</td>
<td>404.80 ± 7.80</td>
<td>452.4 ± 7.57</td>
</tr>
<tr>
<td>Total litter weight at birth (kg)</td>
<td>7.26 ± 0.87</td>
<td>5.90 ± 0.72</td>
<td>5.6 ± 0.68</td>
</tr>
<tr>
<td>Individual litter weight at birth (kg)</td>
<td>6.17 ± 0.48</td>
<td>6.00 ± 0.71</td>
<td>5.32 ± 0.74</td>
</tr>
<tr>
<td>Litter size at birth (nos)</td>
<td>1.18 ± 0.12</td>
<td>1.00 ± 0.09</td>
<td>0.96 ± 0.09</td>
</tr>
<tr>
<td>Litter weight at weaning (kg)</td>
<td>5.17 ± 0.48</td>
<td>5.20 ± 0.58</td>
<td>3.80 ± 0.58</td>
</tr>
<tr>
<td>Litter weight at weaning (kg)</td>
<td>30.46 ± 1.98</td>
<td>28.85 ± 1.41</td>
<td>23.04 ± 3.99</td>
</tr>
<tr>
<td>Individual litter weight at weaning (kg)</td>
<td>6.11 ± 0.60</td>
<td>5.79 ± 0.62</td>
<td>6.01 ± 0.19</td>
</tr>
<tr>
<td>Weaning percentage</td>
<td>84.7 ± 5.51</td>
<td>84.33 ± 6.74</td>
<td>67.33 ± 3.36</td>
</tr>
</tbody>
</table>

Values are presented as Mean ±SEM. Means bearing the different superscripts in the same row differ significantly (P<0.01). NS = Non significant.
et al. 2009) are available on the small holder pig farmers in the developing countries. All these reports described about the feeding and management practices followed by the small holder farmers in the area. De et al., (2014) reported that no concentrate feed was offered to the Nicobari pigs in Nicobar group of Islands. However, feeding of concentrated feed to the pigs varies from 5% to 26 % as reported by several authors (Nath et al. 2013; North-Eastern region of India; 7% by Phengsavanh et al. 2010 at Lao People’s Democratic Republic (PDR) to 26.0 % by Kumarason et al., 2007 at North-Eastern region of India). Therefore, an attempt was made to compare farmers’ feeding practice with three types of diet made of locally available conventional energy and protein ingredients like coconut cake, maize, wheat, rice bran and colocasia leaves in different proportion. Significantly (P<0.01) early onset of puberty, age at first conception and age at first farrowing were recorded for the pigs kept under control and T1 groups compared to farmers feeding practice-2 (T2). The reports are in consistence with the results of Nath et al., (2013) when they fed with household wastes and harvested plants recorded the litter sizes at birth (local, 4.3±0.45; crossbreed, 7.2±0.33), at weaning (local, 2.79±0.24; crossbreed, 6.1±0.21), and age at first farrowing (local, 365.39±7.96 days; crossbreed, 337.24±8.79 days) respectively. Significant (P<0.01) difference was observed in litter size at weaning among the three groups with the lowest value recorded in T2 group. But individual litter weight at weaning did not show any difference. This might be due to the more number of weak litters in T2 group which ultimately died due to low birth weight. Kadirvel et al., (2013) also reported similar weaning litter size in the non-descrip t pigs reared under smallholder production system in North-Eastern India. Litter size at birth and weaning varied widely (Kumerason et al., 2007 and Prakash et al., 2008) under small holder production system. Mortality of the piglets during nursing was significantly higher in T2 group. It might be due to the low birth weight of the piglets. In the pre weaning period, piglets survive on the sow’s milk in this system of rearing. Milk produced by the sow was not sufficient to nurse all the piglets, comparatively heavier piglets sucked more milk from the sow and gained desired body weight to survive up to weaning. The weak piglets remain underfed and succumb. The results were in consistence with the reports of Kumaresan et al., (2009) and Madzimure et al., (2013). Piglets’ mortality up to 50% was not uncommon as reported by Phengsavanh et al., (2010). In this system of pig rearing cost involved for feed was low. Several authors (Mutua et al., 2012; Carter et al., 2013) reported that it becomes popular and plays an important role in the livelihood of many families in rural villages of Western Kenya by practicing this type of feeding. In this report, pigs of the control groups showed better performances in respect of reproductive and productive performances indicating addition of easily digestible energy rich concentrate helps to increase the productivity.

**Growth performances on supplementation of Zinc:** In the tropics, livestock productivity is mediocre in the traditional feeding and management practices. Nutrition is said to be one of the four factors responsible for such mediocre performances. Lots of efforts have been put to improve the nutrition of livestock particularly in respect of carbohydrates and protein, while micro nutrient nutrition is more or less neglected. Kundu et al., (2011) reported that growth performances of Large White Yorkshire pigs were poor when fed with colocasia as one of the feed ingredients in Andaman and Nicobar Islands. Lower levels of macro and micro minerals were reported in blood serum of dairy animals which might be the major cause of reproductive problems (Sunder et al., 2007a). Moreover, the soil, grass and water of Andaman and Nicobar Islands are reported to be deficient in macro and macro minerals particularly Zn and P (Sunder et al., 2007b). Supplementation of 50-100 ppm Zn as zinc oxide in the basal diet of Teressa goat significantly improved performances of reproductive and productive parameters (Kundu et al., 2014). The pigs are reared mostly under free range system and their feed consists of grass, coconut, tree fodders, dried coconut and oil extracted coconut as per the availability in the area. No supplemental feeding is given to explore the productive potentiality of pigs. Digestive disorders, post weaning diarrhoea and impaired performance are common problems

<table>
<thead>
<tr>
<th>Age of the piglets</th>
<th>Control (kg)</th>
<th>Treatment –I (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial (8th week)</td>
<td>07.28 ± 0.23</td>
<td>07.10 ± 0.25</td>
</tr>
<tr>
<td>1st fortnight</td>
<td>11.58 ± 0.27</td>
<td>11.53 ± 0.30</td>
</tr>
<tr>
<td>2nd fortnight</td>
<td>15.83 ± 0.26</td>
<td>16.03 ± 0.31</td>
</tr>
<tr>
<td>3rd fortnight</td>
<td>20.33 ± 0.32</td>
<td>22.75 ± 0.83</td>
</tr>
<tr>
<td>4th fortnight</td>
<td>25.33± 0.36</td>
<td>28.68± 0.65</td>
</tr>
<tr>
<td>5th fortnight</td>
<td>29.13 ± 1.14</td>
<td>34.43± 0.43</td>
</tr>
<tr>
<td>6th fortnight</td>
<td>34.18 ± 1.13</td>
<td>39.98 ± 0.48</td>
</tr>
<tr>
<td>Total Gain (90days)</td>
<td>26.90± 0.91</td>
<td>32.88± 5.10</td>
</tr>
<tr>
<td>Over all daily weigh gain (g)</td>
<td>298.88± 10.05</td>
<td>365.00± 2.46</td>
</tr>
</tbody>
</table>

Values are presented as Mean ±SEM. Means bearing the different superscripts in the same row differ significantly (P<0.01). NS= Non significant.
among weanling piglets (Smith et al., 2010; Kim et al., 2012). Supplementation of 2000–4000 ppm Zn as ZnO in the diet of weaned piglets is common to minimize weaning diarrhoea and increases growth performance (Hahn and Baker 1993; Poulsen 1995; Carlson et al., 1999). Reports are negligible to document or explain the interactions between plant source of nutrients and zinc in weanling piglets. Significantly higher daily body weight gain was recorded in the piglets receiving 80 ppm Zn supplementation as compared to those of control one in our result (Table 3). The result of the study is consistent with the findings of Kumar et al. (2004) where piglets receiving 100 ppm Zn supplementation achieved higher daily weight gain than the control group (50ppm).

CONCLUSIONS
The results showed that the sow receiving the ration made up of colocasia, rice bran was as efficacious as of ration made up of coconut cake, broken rice or maize in respect of reproductive performances. But it could not able to nurse the piglets up to weaning as piglet mortality was higher in this group. In these study pigs of the control groups showed better performances in respect of reproductive and productive performances due to addition of easily digestible energy rich concentrate helped to increase the productivity. Similarly inclusion of 80 ppm Zn in weanling piglets ration also helped to increase the daily body weight.

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CONFLICT OF INTEREST
There is no conflict of interest in the present study.

REFERENCES


