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Effect of inorganic selenium on reproductive performance of Large White Yorkshire gilts*

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ABSTRACT

A study was carried out to find out the influence of dietary selenium on the reproductive performance of gilts at Swine Breeding Unit, Livestock Research Station. Tamil Nadu. Twenty four Large White Yorkshire gilts, at breeding age, were randomly allotted to three groups of eight gilts each. The dietary treatments groups were 0.1 ppm of Se, 0.3 ppm of Se and control diet devoid of Se. Dietary supplementation of selenium at 0.1 ppm and 0.3 ppm resulted significantly ($P<0.01$) higher mean litter size at birth and weaning than control. Similarly, differences in mean birth weight was significantly ($P<0.05$) higher (1.30 ± 0.06 kg) at 0.3 ppm compared to 1.23 ± 0.07 kg in 0.1 ppm selenium and a very poor weight of 1.10 ± 0.04 kg in control. The mortality rate remained significantly ($P<0.05$) lower in 0.3 ppm (8.23 ± 3.12) and 0.1 ppm selenium groups (10.87 ± 3.18). There were highly significant ($P<0.01$) reductions both in SGOT and SGPT activity at gestation and lactation stages by selenium supplementation irrespective of the levels.

Key words : Selenium, reproduction, blood profile, pigs

The raising of pigs in confinement requires selenium as micro nutrient and act as a antioxidant for their normal life process and attainment of high levels of production. Piatkowshi et al. (1979) reported that inorganic Se fortification improved the swine reproductive performance. A significant improvement in reproductive performance has been demonstrated in response to injectable selenium during gestation in sows (Chavez and Patton, 1986). Glutamic - Oxaloacetic transaminase (SGOT) and glutamic-pyruvic transaminase (SGPT) has been interperated to indicate a release of the enzymes from damaged tissue into the blood stream (orstadius *et al.*, 1959). The purpose of this investigation was to evaluate the efficacy of supplementing reproductive diets with inorganic selenium and to evaluate its effects on blood SGOT and SGPT level and reproductive performance of gilts.

MATERIALS AND METHODS

The study was conducted with Twenty four Large White Yorkshire gilts, at breeding age, at the Swine Breeding Unit, Livestock Research Station, Kattupakkam in Tamil Nadu. The gilts were randomly allotted to three dietary treatment groups of eight gilts each. The first group devoid of Se as control, the second group was 0.1 ppm of Se and third group 0.3 ppm of Se as sodium selenite. The supplemental selenium diets were fed on the day of mating to the day of weaning of the litter.

The gilts were hand mated with single boar at the time of breeding. The blood samples were collected from the anterior vena cava at breeding, at 30, 60 and 90 days post coitus and 14,28 and 42 days of post partum. Blood SGOT and SGPT as on index of Se status were estimated by using spectrophotometer. The reproductive performances recorded were, average litter size at birth, average litter weight at weaning and preweaning mortality (0-56 days). The data collected during the period of study were classified and analysed as per the method suggested by Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

Supplementation of selenium in the diet of the gilts both at 0.1 and 0.3 ppm resulted significant ($P<0.01$) increase in litter size at birth (11.50 ± 0.38 and 13.00 ± 0.38) compared to the control group (9.50 ± 0.33, Table 1). Most of the authors uniformly opined that selenium supplementation at different levels in the diet significantly improved the litter size at birth (Ramisz *et al.*, 1993; Mavromatis *et al.*, 1999 and Rafai and Jakab 2000). In the contrary Mahan and Kim (1996) reported

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Table 1. Mean ± S.E of reproductive performance of gilts and its analysis of variance in different treatments

Reproductive performance	Control	Se-0.1 ppm	Se-0.3 ppm	'F' Value
Litter size at birth	9.50±0.33^{a}	11.50±0.38^{b}	13.00±0.38^{b}	23.55**
Litter size at weaning	8.25±0.25^{a}	11.13±0.23^{b}	12.50±0.33^{c}	63.85**
Litter weight at birth (kg)	1.10±0.04^{a}	1.23±0.07^{ab}	1.30±0.06^{b}	3.33*
Litter weight at weaning (kg)	10.33±0.21^{a}	10.45±0.23a	10.73±0.19^{a}	0.93
Preweaning mortality (Percent)	21.18±3.94^{b}	10.87±3.18^{ab}	8.23±3.12^{a}	3.97**

Values bearing different superscripts in row differ significantly
* Significantly at five per cent level (P<0.05)
** Significantly at one per cent level (P<0.01)

that litter number born/litter were not affected by dietary supplementation of selenium. Compared to the litter size at birth, the litter size at weaning was reduced uniformly in all the three treatment groups. However the selenium at 0.3 ppm group produced a significant (P<0.01) increase in the mean litter size at weaning (12.50±0.33) followed by selenium (0.1 ppm at 11.13 ± 0.23) which was significantly (P<0.01) higher than that of the control group (8.25±0.25). It was inferred that addition of selenium in the feed of breeding sows not only increased the litter size at birth but also improved the survival rate of suckling piglets. Similar were the views expressed by Ramisz *et al.* (1993) and Mavromatis *et al.* (1999).

Sows in the group that did not receive any supplemented selenium gave birth to piglets with significantly (P<0.05) lower body weights (1.10±0.04 kg), whereas selenium at 0.3 ppm in the diet produced piglets with significantly (P<0.05) heavier birth weights (1.30±0.06 kg). A similar trend was reported by Mahan and Kim (1996), the litter weights at birth were higher when gilts were fed with 0.3 ppm selenium than gilts fed with 0.1 ppm. On the other hand, Wilkinson *et al.* (1977) did not find any improvement in birth weight by feeding selenium treated diets. Dietary supplementation of selenium to the breeding sows had not brought about any noticeable change in the weight at weaning of the offsprings compared to the ones that did not receive selenium.

Mortality among piglets in the preweaning stage was

Table 2. Mean + S.E of blood SGOT and SGPT (l/lit) during gestation and lactation of sows in different treatments with analysis of variance.

Gestation	SGOT (l/lit)			'F-'value	SGPT (l/lit)			'F'-value
	Control	Se-0.1 ppm	Se-0.3 ppm		Control	Se-0.1 ppm	Se-0.3 ppm	
0	67.75±0.37	67.50±0.57	67.63±0.50	0.07	26.00±0.27^{b}	24.88±0.48^{ab}	24.50a + 0.42	3.8*
30	72.88±0.67^{b}	15.00±0.80^{a}	13.88±0.64^{a}	2284.1**	29.25±0.37^{b}	17.75±0.75^{a}	16.50a + 0.42	169.4**
60	76.38±0.50	12.38±0.32^{a}	12.38±0.42^{a}	7742.6**	47.63±1.41^{b}	8.50±0.33^{a}	7.75a + 0.37	697.1**
90	82.50±0.53^{b}	27.13±0.72^{a}	25.75±0.49^{a}	3016.5**	55.88±0.55^{b}	17.63±0.60^{a}	16.38 + 0.46	1741.8**
Lactation days								
14	68.38±0.32^{b}	17.88±0.40^{a}	16.88±0.40^{a}	6167.1**	26.38±0.42^{b}	11.50±0.33^{a}	10.25a + 0.25	697.8**
28	81.88±0.93^{b}	22.50±0.42^{a}	21.88±0.52^{a}	2705.4**	52.50±0.68^{b}	12.75±0.59^{a}	12.50a + 0.42	1604.4**
42	88.88±1.13^{b}	32.88±0.79^{a}	31.00±0.57^{a}	1468.2**	61.38±0.60^{c}	18.13±0.30^{b}	16.00 a + 0.27	3831.3**

Values bearing different superscripts in row differ significantly
* Significantly at five per cent level (P<0.05)
** Significantly at one per cent level (P<0.01)

a major problem in pig husbandry. As high as 21.18±3.94 per cent of the piglets in control group died in the preweaning stage which was significantly (P<0.01) higher than 0.3 ppm selenium supplemented group (8.23±3.12). It was in close agreement with that of Ramisz *et al.* (1993) and Rafai and Jakab (2000) indicating that dietary supplementation of selenium increased the preweaning survival rate of piglets.

The level of SGOT and SGPT in the blood indicates metabolic and functional health of various organs and tissues. At the start of the gestation, the SGOT levels in all the three groups remained constant since that was the time, the dietary treatment of selenium was started. But at 30, 60 and 90 days of gestation, the SGOT dropped to a very low activity level in sows that were supplied selenium, both at 0.1 and 0.3 ppm (Table 2). This drop was highly significant (P<0.01). Similarly, throughout the lactation period also, the control group maintained significantly (P<0.01) very high SGOT activity compared to the selenium treated groups. Similar finding was observed by Mahan *et al.* (1974). In both gestation and lactation stages, there were no significant difference between selenium supplementation groups to indicate that addition of selenium in the diet at 0.1 ppm level was as good as addition of 0.3 ppm to bring about the anticipated beneficial effect in reducing the SGOT activity. With regard to blood SGPT, even on the day one of gestation, there was a significant (P<0.05) difference in SGPT level between selenium treated and untreated groups. From 30,60 to 90 days of gestation there was constant building up of SGPT activity in the control group as pregnancy advanced to end up in 55.88±0.55 l/l at 90 days of gestation than the selenium treated groups. During the period of lactation also, dietary supplementation of selenium, irrespective of the level, significantly (P<0.01) reduced the SGPT activity at 14 and 28 days. At 42 days of lactation, the SGPT activity in the untreated group was 61.38±0.60 l/l which was significantly (P<0.01) higher to the selenium treated groups. Selenium at 0.3 ppm bringing about a significant (P<0.01) reduction to 16.00± 0.27 l/l of SGPT as against 18.13 ± 0.30 l/l in sows fed selenium at 0.1 ppm level.

It may be concluded that selenium in the diet for breedable gilts was beneficial to better reproductive performance. Among the two levels of selenium tried, selenium at 0.3 ppm was found to provide better gains in the survival and health of piglets.

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