EFFECT OF PREPARTUM ADMINISTRATION OF SELENIUM AND VITAMIN E ON SUBSEQUENT POSTPARTUM PERFORMANCE IN FIRST CALF NILI-RAVI BUFFALO HEIFERS


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ABSTRACT

The current study was accomplished to determine the effect of pre-calving administration of selenium and vitamin E on post-partum performance of Nili-Ravi buffalo heifers. Thirty Six pregnant Nili-Ravi buffalo heifers were divided in 3 groups (HSE-1, HSE-2 and HNSE). HSE-1 heifers were given single intra muscular injection of selenium (10 mg) and vitamin E (1400 mg) whereas; HSE-2 heifers were given single intramuscular injection of selenium (20 mg) and vitamin E (2800 mg) before 4 and 2 week of expected calving. HNSE heifers were given no treatment and served as control. 4 weeks prior to calving, serum selenium concentrations were not different (P ≥0.05) among heifers of different treatment groups. At the day of parturition, selenium concentrations were higher (P ≤0.05) in HSE-1 and HSE-2 heifers as compared to HNSE heifers. At 4th week after parturition, the milk yield was not different (P ≤0.05) in HSE-1 & HSE-2 heifer as compared to HNSE heifers. At 8th and 12th week after parturition, the milk yield was higher (P ≤0.05) in treated groups in comparison with control group heifers. At 8th week after parturition, milk somatic cells count was lower (P ≤0.05) in HSE-2 heifers in comparison with HNSE heifers. At 12th week after parturition, milk somatic cells count was lower in HSE-1 and HSE-2 as compared to HNSE, the difference being non-significant. The gestation length in all three groups of heifers was almost similar. Among all groups, incidence of sub-clinical mastitis was non-significant (χ²(cal) = 0.94). There was no incidence of retention of fetal membranes in animals of HSE-1 and HSE-2, while 16 % incidence was observed in HNSE heifers. Pre-partum administration of selenium and vitamin E enhanced the subsequent performance of buffalo heifers in terms of milk yield and decreased milk somatic cells count.

Key words: buffalo heifer, selenium, vitamin E, milk production, somatic cell count.

INTRODUCTION

Correlation exists between nutrition and reproduction as severe nutritional deficiencies cause reproductive problems (Smith and Chase, 2004). Nutrition along with good management practices is compulsory for pregnant heifers and upcoming calves. The health of new born calf and post-partum performance of cow is affected by pre-partum status of selenium and vitamin E in the dam (Lacerta et al., 1996) and selenium insufficiency may cause reduced fertility and weak newborn calf (Vanegas and Reynolds, 2004).

The pre-partum period is the beginning of several new intra-mammary infections which underwrites to mastitis and poor quality milk. Lacks of each vitamin E or selenium have been related to higher incidence and intensity of intra-mammary infections resulting in higher number of cases of clinical mastitis and increased somatic cells count (SCC) both in single cow and bulk tank milk (Smith et al., 1997; Morgante et al., 1999). Inflammatory response associated with mastitis causes harm to mammary secretory epithelium and thus, reduced milk production (Oliver and Calvinho, 1995; Rajala-Schultz et al., 1999).

Administration of selenium and vitamin E during pre-partum period may have effect on post-partum performance of buffalo heifers. Therefore, present study was conducted to determine the effect of pre-calving administration of selenium and vitamin E on post-partum performance (in terms of milk yield and milk somatic cells count) of Nili-Ravi buffalo heifers.

MATERIALS AND METHODS

The present study was accomplished at Buffalo Research Institute, Pattoki, District Kasur. Thirty Six pregnant Nili-Ravi buffalo heifers were divided in 3 groups (HSE-1, HSE-2 and HNSE) comprising of 12 animals in each group. The body weight of animals was 400-450 kg. During gestation, animals were given only 60 kg green fodder whereas...
after parturition heifers were fed green fodder along with concentrates (17% CP and 75% TDN) according to their milk production.

HSE-1 heifers were given a single intra muscular injection (Selphos Injection, Selmore Pharmaceuticals, Pakistan) of selenium (10 mg) and vitamin E (1400 mg) while, HSE-2 heifers were given a single intra muscular injection of selenium (20 mg) and vitamin E (2800 mg) before 4 and 2 weeks of anticipated calving (28±3 and 15±3 days, respectively, before actual calving). HNSE heifers were given no treatment and served as control. Each ml of the injection had 0.5 mg as sodium selenite and 70 mg vitamin E.

**Blood sample collection:** Blood samples were collected before feeding from each heifer (before start of treatment) at 4 week before expected calving and at calving day. Hours of blood sampling were 09:30-10:00 am. Samples were then shifted to laboratory of Farm and Health Division, Buffalo Research Institute, Pattoki within 1 hour of collection. Test tubes containing blood were placed in a slanting position for one hour to let the serum separate. The serum was next aspirated carefully with a pipette, labeled and was kept at -20°C until assayed. The serum selenium was determined by atomic absorption spectrophotometer (Varain, AA-5, Australia) after wet digestion of samples. Standard solutions of selenium were prepared.

**Milk sample Collection:** The milk yield of all experimental animals was recorded at 4, 8 and 12 weeks, after calving. About 100 ml of milk was sampled from each animal for the determination of somatic cell count. The samples were cooled immediately after collection. The somatic cell count was determined by following the technique described by Schalm et al. (1971). The somatic cell counts were measured under microscope with a magnification of 15 x 40 in 50 fields and were multiplied by the microscopic factor to get the cells per ml of milk.

Gestation length of all experimental heifers in days was recorded and incidence of sub-clinical mastitis was also recorded. Surf field mastitis test was used to check the animals suffering from sub-clinical mastitis. Surf field solution (3%) was prepared by adding 6 teaspoons of surf in half liter water. The solution was thoroughly mixed, filtered and heated. Milk sample was taken and equal volume of 3% surf solution was added, swirled the mixture for half minute and then examined for gel formation (Muhammad et al., 2010). Duration from parturition to expulsion of fetal membranes was also recorded. The placenta retention of animals more than 12 h was categorized as buffaloes with trouble in coming off placenta (Lacetera et al., 1996).

**Statistical Analysis:** The data were analyzed and means for serum selenium concentration, milk production and somatic cells count were compared using Duncan’s multiple range tests when one way ANOVA showed significance at P ≤0.05 (Steel et al., 1997). Effect of treatments on incidence of sub-clinical mastitis and retention of fetal membranes were calculated by Chi square test.

**RESULTS AND DISCUSSION**

**Serum Selenium:** The mean (± SE) serum selenium concentrations in different groups of heifers during 4 week before parturition and at day of parturition has been shown in Table-1.

Serum selenium concentrations at the stage of 4 weeks prior to calving were not different (P ≥0.05) among heifers of different treatment groups. At the day of parturition, selenium concentrations were higher (P ≤0.05) in HSE-1 and HSE-2 heifers as compared to HNSE heifers. The selenium concentrations were higher than rest of treatment groups. Hidiroglou & Batra (1994) also reported increase in selenium concentrations in plasma of cows given injections of selenium and vitamin E before calving. Abdelrahman & Kincaid (1995) found decrease in serum selenium concentrations for the period of last 60 days of gestation stressing the significance of selenium administration during last trimester of pregnancy. Gerloff, (1992) reported that in lactating cows, about consumption of at least 6 mg per day selenium is necessary to maintain serum selenium concentrations at 70 μg/l.

**Milk Yield:** At 4th week after parturition, the milk yield was not different (P ≥0.05) in HSE-1 & HSE-2 heifer as compared to HNSE heifers. At 8th and 12th week after parturition, the milk yield was higher (P ≤0.05) in treated (HSE-1 & HSE-2) groups in comparison with control group (HNSE) heifers (Table-2). These results are in agreement with Lacetera, et al. (1996) who reported increase in milk production in dairy cows supplemented with selenium and vitamin E. Lacetera et al. (1996) further added that during parturient period, efficiency of lactating cows is affected by selenium and vitamin E concentrations in blood. The eminent protective role of GSH-PX and vitamin E on membrane integrity might epitomize however one of the mechanisms over which selenium and vitamin E boosted milk production (Lacetera et al., 1996). In current study, selenium was increased in treated heifers which in turn resulted in increase in milk production.
Somatic Cell Count: At 8\textsuperscript{th} week after parturition, milk somatic cells count was lower (P \leq 0.05) in HSE-2 heifers in comparison with HNSE heifers. At 12\textsuperscript{th} week after parturition, milk somatic cells count was lower in HSE-1 and HSE-2 as compared to HNSE, the difference being non-significant (Table-3). The quality of milk in a herd and the presence of mastitis both can be assessed by somatic cell (Smith, et al., 1997). Pavlata et al. (2003), found high correlation between blood selenium concentrations and glutathione peroxidase activity. In group HSE-2 heifers, administration of 20 mg selenium and 2800 mg vitamin E about 28 and 15 days before expected calving reduced the somatic cells count in milk. Vitamin E supplementation above the marginal level augments cell mediated and humoral immunity (Chung and Wan, 2000).

Gestation Length and Incidence of sub-clinical mastitis: In the present study, the gestation length was recorded as 309 (HSE-1 & HNSE) and 310 (HSE-2) days. These finding corroborated with Moeini et al. (2009).

Incidence of sub-clinical mastitis was 8% in HSE-1, HSE-2 heifers and 33% in HNSE animals. The incidence of sub-clinical mastitis was lower in HSE-1 and HSE-2 as compared to control (HNSE), but the difference among three groups was non-significant ($\chi^2_{\text{cal}} = 0.94$). When any infectious agent got entry in the body, then first line of defense in the body is neutrophils. The neutrophils function improves after selenium administration as cows given 0.1-0.2 ppm selenium killed mastitis causing organisms more efficiently as compared to cows given no selenium (Moeini, et al., 2009). Many workers (Weiss 2003; Smith et al., 1997) have reported that higher selenium concentrations in the serum were associated with lower rates of clinical mastitis. Vitamin E functions along with selenium which is a primary antioxidant.

Incidence of retention of fetal membranes: There was no incidence of retention of fetal membranes in animals of HSE-1 and HSE-2, while 16 % incidence was observed in HNSE heifers. These findings are in agreement with Moeini et al. (2009).

<table>
<thead>
<tr>
<th>Sampling Day</th>
<th>HSE-1</th>
<th>HSE-2</th>
<th>HNSE</th>
</tr>
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<tbody>
<tr>
<td>4 Week Before Parturition</td>
<td>65 ± 19</td>
<td>64 ± 15</td>
<td>67 ± 15</td>
</tr>
<tr>
<td>At Parturition Day</td>
<td>85 ± 18\textsuperscript{a}</td>
<td>98 ± 17\textsuperscript{b}</td>
<td>61 ± 14\textsuperscript{c}</td>
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Values sharing different superscripts in a row differed significantly (P \leq 0.05)

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<th>HNSE</th>
</tr>
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<tbody>
<tr>
<td>4 Week After Parturition</td>
<td>10.8 ± 1.71</td>
<td>10.6 ± 1.49</td>
<td>9.8 ± 1.19</td>
</tr>
<tr>
<td>8 Week After Parturition</td>
<td>9.9 ± 1.33\textsuperscript{bc}</td>
<td>10.1 ± 1.81\textsuperscript{b}</td>
<td>8.3 ± 1.31\textsuperscript{a}</td>
</tr>
<tr>
<td>12 Week After Parturition</td>
<td>9.1 ± 1.76\textsuperscript{c}</td>
<td>9.5 ± 1.52\textsuperscript{b}</td>
<td>7.8 ± 1.56\textsuperscript{a}</td>
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Values sharing different superscripts in a row differed significantly (P \leq 0.05)

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<tbody>
<tr>
<td>4 Week After Parturition</td>
<td>220 ± 48</td>
<td>215 ± 54</td>
<td>236 ± 41</td>
</tr>
<tr>
<td>8 Week After Parturition</td>
<td>192 ± 45\textsuperscript{ab}</td>
<td>188 ± 53\textsuperscript{a}</td>
<td>205 ± 48\textsuperscript{b}</td>
</tr>
<tr>
<td>12 Week After Parturition</td>
<td>225 ± 53</td>
<td>213 ± 41</td>
<td>240 ± 51</td>
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Values sharing different superscripts in a row differed significantly (P \leq 0.05)

Conclusion: It was concluded from the results of present study that pre-partum administration of Selenium and Vitamin E enhanced the subsequent performance of buffalo heifers in terms of milk yield and decreased milk somatic cells count.

REFERENCES


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