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Abstract

The present study was designed to evaluate the effect of vitamin E and selenium injected pre partum along with PGF2α or Methylergometrine maleate administered after calving on postpartum reproductive and productive performance in cross bred dairy cows. A total of 40 pregnant animals in their last trimester were selected and divided into 4 Groups with 10 animals in each group. Animals in Group I, II and III were given two injections of vitamin E and selenium (Inj. Repronol, cadila pharmaceutical ltd.) 7 days apart (1st injection given at 30-60 days before the expected date of calving), while animals in Group IV were kept as control. Animals in Group I and II were also administered with 2 ml PGF2α (inj. Pragma, 500µg, I/M, Intas Pharmaceuticals ltd) and 5 ml Methylergometrine maleate (Inj. Nexbolic, 5mg, I/M, Intas Pharmaceuticals ltd) respectively, immediately after calving. However, animals in group III and IV were given 10 ml NSS I/M just after parturition. The time required for expulsion of placenta, uterine involution, occurrence of 1st postpartum heat, conception rate were recorded. The placental expulsion period and uterine involution period was significant higher in Group IV as compare to Group I, II and III animals. Conception rate was observed higher in Group II (80%) animals followed by 70%, 50% and 40% in Group I, III and IV respectively and there was a non-significant increase in colostrum production, lactational yield, lactational length and mean calf birth weight in pre partum vitamin E-Se supplemented animals as compare to non-supplemented animals.

Keywords: Cattle, Methylergometrine, PGF2α, pre partum, post-partum, vitamin e-Se

Introduction

The post-partum period of dairy cow determines productive and reproductive responses during lactation and is therefore, a pivotal time in the production cycle of the cow. During this period, immune suppression commonly occurs and cows suffers to a number of diseases which dramatically affects reproductive efficacy of animals causing considerable economic loss to dairy industry due to slower uterine involution, reduce reproductive rate, prolonged inter conception period and calving interval, high cost of medication, drop in milk production, reduced calf-crop and early depreciation of potentially useful animals (Resum et al. 2017) [18]. However, Successful attempts have been made to improve the reproductive as well as productive performance of cows and buffaloes by providing them with vitamin E-selenium during late gestation (Qureshi et al. 2010; Resum et al. 2016) [18, 17]. Which as a cellular antioxidant, interacts with selenium containing glutathione peroxidase (GPx) to prevent the oxidative breakdown of tissue membranes. The role of vitamin E and Se supplementation in maintenance of health and fertility in dairy cows has been widely investigated and responses have been manifested as increases in fertilization and pregnancy rates, reduction on the number of days open, decrease in the incidence of ovarian cyst, and retained placenta (Harrison et al. 1984; Graham, 1991) [6, 4].

Methylergometrine is a smooth muscle constrictor that now a days has been widely used for enhancement of uterine contraction after parturition, treatment of postpartum retained placenta, metritis and uterine involution after manual correction of prolapsed uterus (Patel et al. 2014) [13]
Alagar et al. (2016) reported that administration of Methylergometrine maleate immediate during post-partum period effectively hastened the uterine involution rate in HF cross bred cow. PGF<sub>2α</sub> is an excellent reproductive management tool for dairy cows. Administration of PGF<sub>2α</sub> during fresh period has been shown to have favourable effect on fertility including a shortened time to first service, increase estrus detection efficiency, improved uterine health and improved first service conception rate. Patel et al. 2016 reported that use of the PGF<sub>2α</sub> immediately after parturition in cows induced earlier postpartum estrus suggesting its strong luteolytic effect and early resumption of ovarian activity. Keeping in view all above facts, the present study was conducted to investigate the combined effect of Vitamin-E-Selenium and PGF<sub>2α</sub> or Methylergometrine maleate on reproductive and productive parameters of cross bred dairy cows.

Material and Methods
Experimental location
The present study was conducted at the Military Dairy Farm Jammu (J&K) during the period between October 2014 to January 2017.

Selection of the Animals
Forty crossbred cows in their last trimester of pregnancy (30-60 days pre partum), aged between 4-8 years, with parity 2 to 5 were randomly selected and assigned to four experimental groups with 10 animals in each group. The details of treatment schedule has been depicted in Table 1. Animals in group I, II and III were given two injections of vitamin E and selenium (Inj. Repronol, containing 50 mg α-tocopheryl acetate and 1.5 mg selenium per ml, (Cadila Pharmaceuticals ltd) @ 1ml/50 kg body weight I/M. First injection was given at 30 to 60 days before the expected days of calving followed by a second injection 7 days later, while animals in group IV were kept as control. Animals in group I and II were also administered PGF<sub>2α</sub> (Inj. Pragma, 500µg, I/M, Intas pharmaceuticals Ltd.) and Methylergometrine maleate (Inj. Nексоби, 5mg, I/M, Intas Pharmaceuticals ltd) respectively, immediately after calving. However, animals in group III and IV were given 10 ml NSS I/M just after parturition.

Management Practices
The experimental cows were maintained under general management practice as followed for rest of the herd. They were fed ration consisting of concentrates (groundnut cakes, mustard cake, maize grain and wheat bran), roughages (either berseem and maize or oat fodder), mineral mixture and salt. Fresh tap water was available ad libitum. All the experimental cows were observed closely before, during and after parturition. Cows were made to parturate in individual pen and time required for expulsion of fetal membrane was recorded. Within two hours after parturition, colostrum was removed by hand milking and total colostrum quantity was measured for three consecutive days. The cows were per rectally explored twice a week after one week postpartum to assess the uterine involution period. Estrus was detected by parading bull followed by visual observation of estrus sign twice in a day and later confirmed by genitalia examination per rectum. The cows found in true estrus were artificially inseminated using frozen thawed semen of acceptable quality, 10 to 12 hours after the onset of estrus. Pregnancy diagnosis was done by rectal examination after 60 days post service. Lactation length, lactation yield and birth weight of calves born to the control and treated cows were also recorded.

Table 1: Grouping of animals

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameters</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Expulsion of fetal membrane (Hrs)</td>
<td>4.76±0.39&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.55±0.41&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.23±0.55&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.93±0.72&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Involition of uterus (Days)</td>
<td>39.92±1.44&lt;sup&gt;a&lt;/sup&gt;</td>
<td>37.81±1.37&lt;sup&gt;a&lt;/sup&gt;</td>
<td>48.40±2.68&lt;sup&gt;b&lt;/sup&gt;</td>
<td>65.40±2.34&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>First post-partum heat ( Days)</td>
<td>50.30±2.10&lt;sup&gt;a&lt;/sup&gt;</td>
<td>49.66±1.96&lt;sup&gt;a&lt;/sup&gt;</td>
<td>52.90±2.23&lt;sup&gt;b&lt;/sup&gt;</td>
<td>70.11±2.49&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

The values having different small superscripts within a row differ significantly (P<0.05).

Table 3: Effect of different treatment on conception rate of cross bred dairy cows

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameters</th>
<th>Group I (%)</th>
<th>Group II (%)</th>
<th>Group III (%)</th>
<th>Group IV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; service conception rate</td>
<td>4/10(40.00%)</td>
<td>6/10(60.00%)</td>
<td>1/10(10.00%)</td>
<td>2/9(22.22%)</td>
</tr>
<tr>
<td>2</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; service conception rate</td>
<td>1/10(16.66%)</td>
<td>1/1(100.00%)</td>
<td>0/6(0.00%)</td>
<td>2/9(22.22%)</td>
</tr>
<tr>
<td>3</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; service conception rate</td>
<td>2/9(50.00%)</td>
<td>1/3(33.33%)</td>
<td>1/6(33.33%)</td>
<td>1/7(14.28%)</td>
</tr>
<tr>
<td>4</td>
<td>Over all</td>
<td>7/10(70.00%)</td>
<td>8/10(80.00%)</td>
<td>5/10(50.00%)</td>
<td>4/10(40.00%)</td>
</tr>
</tbody>
</table>

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Discussion

Findings of the present study are in agreement with that of Resum et al. (2016) [17] who reported significant shorter expulsion period and uterine involution period in animals supplemented pre partum with vitamin E- Selenium as compared to control animals. However, group I & II shows significant (P<0.05) shorter placental expulsion, uterine involution and first post-partum estrus period as compared to group III animals. These findings are in agreement with Patel et al. (2016) [12] who reported beneficial effects of PGF2α or Methylergometrine administration after calving in cross bred cows.

Supplementing vitamin E-Selenium prepartum significantly increased neutrophil chemotaxis (Politis et al. 1996) [14] which possess greater phagocytic activity at calving thus boosting immunity of animal which might be a factor for quicker recognition of fetal membrane by animal immune system (Resum et al. 2016) [17]. Administration of Methylergometrine maleate just after parturition greatly reduces incidence of placental retention and enhance uterine involution (Patel et al. 2014) [13]. Alagar et al. (2016) [1] reported faster uterine involution in cows treated with methylergometrine post calving indicating the role of uterotonic drugs in reducing the size of uterus after calving. Better conception rate in this group might be due to early shedding of fetal membrane and early uterine involution which has a positive impact on reproductive performance of dairy cattle. Inadequate production of endogenous prostaglandin has been associated with delay in uterine involution postpartum (Kindahl et al. 1984; Madej et al. 1984) [8, 11]. Administration of PGF2α in early postpartum period has been shown to accelerate uterine involution and early return to fertile ovarian cyclicity (Lindell and Kindahl, 1983) [10]. Similar results regarding uterine involution following PGF2α administration in early postpartum were also reported earlier in cattle (Raut et al. 2016) [16]. Jayakumar and Balakrishnan (2012) [7] reported shorter uterine involution period and high conception rates in animals treated postpartum with PGF2α. Patel et al. (2016) [12] reported that injecting PGF2α after calving has direct effect on bovine ovary causing luteolysis of pregnancy CL and thus accelerate postpartum ovarian activity. However, Young (1989) [20] reported improved conception rate with PGF2α injected at early postpartum period was not the consequences of luteolysis rather the result of myometrial contraction which accelerated uterine involution (Garcia-villard et al. 1987; Gustafsson, 1984) [2, 5].

Productive performance data shows supplementation of Vitamin E-Se tend to increase colostrums production, lactation yield and lactation length. Similar findings were reported by Resum et al. (2016) [17] who reported non-significant increase in colostrum production, lactational yield and lactational length in pre partum vitamin E-Se supplemented animals as compare to non-supplemented animals. Glutathione peroxidase is a selenium containing enzyme that in combination with vitamin E catalyses the reduction of hydro peroxidase and a range of lipid hydro peroxidase to protect biological membrane from oxidative stress which might be a reason for increase milk yield in supplemented animals (Resum et al. 2016) [17]. Vitamin E is a lipid soluble antioxidant that increases the efficacy of neutrophils by preserving them from intra cellular killing of ingested bacteria (Herd and Stowe, 1991) [4]. Which helps in decreasing the incidence of mastitis in supplemented animals leading to increase milk production (Resum et al. 2016) [17]. Lacetera et al. (1996) [9] reported 10% increase in milk production in animals supplemented with vitamin E. Birth weight of calves born to animals supplemented pre partum with vitamin E and selenium was non-significant higher as compare to calves born to un-supplemented animals. Similar findings were reported by Godfrey and Barker (2000) [3] and Resum et al. (2016) [17] who reported better growth performance of calves of vitamin E-Se supplemented animals which might be due to sparing effect of selenium on fetal body mass (Godfrey and Barker, 2000) [3]. Pre partum Supplementation of vitamin E and selenium shown to enhance the secretion of immune proteins, immunoglobulin in colostrum by 80% and ameliorate growth and immune status and growth performance of the calves. (Resum et al. 2016) [17]

Conclusion

Administration of PGF2α or Methylergometrine maleate after calving in pre partum vitamin E-Se supplemented animals have shown positive effect in improving the post-partum reproductive as well as productive parameters in cross bred dairy cattle in the present study.

References

9. Lacetera N, Bernabucci U, Ronchi B, Nardone A. Effect of selenium and vitamin e administration during a late


