Pregnancy depresses milk yield in Dairy Buffaloes

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ABSTRACT: This paper reports the decline in milk production of buffaloes after getting conceived. The experimental buffaloes were selected in NWF province of Pakistan. Complete milk yield records for 48 weeks of lactation were obtained for 465 pregnant and 179 non-pregnant buffaloes. Model-1 to 3 were used to find out the factors affecting milk yield reduction due to pregnancy. Model 4 was used to modulate milk yield reduction with the onset of pregnancy at medium sized private farms comprising lactation records of 40 buffaloes. The data indicate that post-conception reduction in milk yield was earlier in the buffaloes that conceived during 11-28 weeks of lactation, followed by those conceived during 29-36 and 37-48 weeks of lactation respectively. Noticeable reduction in milk yield was found during 3rd, 5th and 6th month of pregnancy in the animals conceiving at earlier, mid or later stages of lactation. Initially the milk yield in pregnant animals increased up to 2 months post-conception and then decreased at an almost constant rate. The reduction was visible after 5th week post-conception. The decline in milk with advancement pregnancy was slight up to a point which we declared as joining point; thereafter the decline was much greater.

Key words*:* Milk yield, Pregnancy, Reproduction, Buffaloes.

INTRODUCTION - Buffalo is the major source of milk production contributing 12.1% in World, 38.0% in Asia, 55.0% in India, 66.6% in Pakistan, 16.4% in China, 50.8% in Egypt and 65.2% in Nepal's total milk production (Ref.. ?). During the last 40 years the world buffaloes showed a constant increase by 100%, while the cattle population increased to 40% for 20 years and during the next 20 years it remained almost constant. In Italy, buffalo population has increased by 13 times to 0.24 million heads during the last 47 years while the dairy cattle population declined by 40%. China has introduced dairy characteristics in their swamp buffaloes through crossbreeding with dairy buffaloes form India and Pakistan (Borghese, 2006). The buffaloes of India and Pakistan are dairy type with black color and curled or sickle shaped horns; named River buffaloes by Macgregor (1939) but these authors have used the word Dairy buffaloes for them, due to their dairy characteristics (Qureshi, *et al.*, 1999). Karmarker (1964) reported a daily milk yield of 8.0 and 9.1 kg in Bombay and Pargaon districts. Fat contents of milk is about 8%. Production of average fat corrected milk has been reported to be 15.31 and 13.55 kg/day in the normal and low breeding seasons in Nili-Ravi dairy buffaloes ($P<0.01$; Qureshi, *et al.*, 1999), ranging from 2 to 35 kg/day. It has largely been assumed that the milk production cost of pregnancy occurs through a combination of increased fetal demands for energy from 190 d of gestation onwards (NRC, 2001), and

a hormonally mediated partitioning of nutrients away from milk production (Oltenacu *et al.*, 1980). This paper reports the decline in milk production of buffaloes after getting conceived.

MATERIAL AND METHODS - The experimental buffaloes were selected in the central valley of NWF province of Pakistan situated at 31-37^0 N and 65-74^0 E. Climate of this region is of continental type. The experimental units were three large sized state farms (number of animals varying from 150 to 1000) and one medium sized private commercial farm with an animal's strength of 100. The basis of this categorization was the difference between the objectives and operating procedures of these operations. At larger state farms data on milk production was collected for the period from the year 1995 to 2005. Complete milk yield records for 48 weeks of lactation were obtained for 465 pregnant and 179 non-pregnant buffaloes from three locations and thus a total of 30912 weekly milk yield records. The following full model-1, involving gestation stage in month was fitted using all the 30912 records. Then a reduced model-2 was fitted excluding gestation stage.

Model 1 : $\mathbf{Y = L + P + LxP + LW + GM + E}$
Model 2 : $\mathbf{Y = L + P + LxP + LW + E}$

Where ***Y*** is milk yield, ***L*** is location (n=3), ***P*** is parity (n=6), ***LW*** is lactation week (n=23), ***GM*** is gestation month (n=10), ***E*** is the residual term associated with the model. For investigating the reduction in milk yield due to pregnancy, the average milk yield of the pregnant buffaloes for each of the 48 lactation weeks were subtracted from the milk yield of the respective lactation weeks of non-pregnant buffaloes. Only the data for lactation weeks after conception were analyzed to find out the milk reduction. The following model was used to analyze the data based on general linear model in Minitab statistical package (Minitab Inc. State College PA 16801-3008, USA), to find out the factors affecting milk yield reduction due to pregnancy.

Model 3 : $\mathbf{Y = L + CS + P + LW + GM + E}$

Where ***Y*** is reduction in milk yield, ***L*** is location (n=3), ***CS*** is conception season (n=4), ***P*** is parity (n=6), ***LW*** is lactation week (n=23), ***GM*** is gestation month (n=10), ***E*** is the residual term associated with the model. The milk records were divided in three subsets : lactation weeks 11-28 (early lactation) ; 29-36 (mid lactation); and 37-48 (late lactation). At medium sized private farms the reduction in milk yield due to pregnancy was calculated as difference between milk yield of 23 pregnant and 17 non–pregnant buffaloes. The data for milk yield per week for the 1 to 23 weeks after pregnancy was used to modulate milk yield reduction due to pregnancy. Two straight lines model (Draper and Smith, 1981, Neter *et al.* 1985) with a joining point at 8 weeks had an R^2 of 0.9629, while the quadratic model also gave a good fit with an R2 of 0.9863. For dairy cows, Coulon et al (1995) used an equation with the correcting term ***Pw – 18*** to force the model into 0 value at the 18th pregnancy. The authors used the correction term of ***Pw – 5***, because the visible effect of pregnancy was noted from 5th week post-conception. The model was modified as follows:

Model 4 $\mathbf{Y = -e^{0,9602}\,[(PW\text{-}5)]e^{-0,15PW}\ R^2=0,9445}$

RESULTS AND CONCLUSIONS - The data in Table 1 indicates that post-conception reduction in milk yield was earlier in the buffaloes that conceived during 11-28 weeks of lactation, followed by those conceived during 29-36 and 37-48 weeks of lactation respectively. Noticeable reduction in milk yield was found during 3rd, 5th and 6th month of pregnancy in the animals conceiving at earlier, mid or later stages of lactation. Figure 1 shows the change in milk yield with the advancement of pregnancy as compared to the non-pregnant animals. It is evident that initially the milk yield in pregnant animals increase up to 2 months post-conception and then decreases at an almost constant rate. The initial increase may be due to association of the milk yield efficiency with the reproductive efficiency as the animals that conceived also produced higher quantity of milk.

The reduction was visible after 5th week post-conception as evident from Figure 2. The linear model did not give good fit which also clear from the predicted values of the model. The quadratic model though gave good fit yet earlier predicted values seem to be slightly different from the actual values. The line JP8 model also gave good fit and the predicted values are much closer to the actual values. The decline in milk with advancement pregnancy was slight up to a point which we declare as joining point; thereafter the decline was much greater. The reduction in high yielding buffaloes was slight up to 16th week but later on it became drastic. In the medium production buffaloes the reduction was the least while in the low producing buffaloes the reduction was moderate. The little decline in the low yielding buffaloes is due to the lower milk yield in these animals and therefore the little post-conception reduction in milk yield.

Table 1. Reduction in milk yield at different months after conception (Mean ± SE).*

Month after Conception	Lactation stage when the animal conceived		
	Weeks 11-28	Weeks 29-36	Weeks 37-48
1	0.944± 0.4370	5.289 ± 1.0178	8.624 ± 3.8918
2	-0.757 ± 0.7174	3.341 ± 0.7953	4.940 ± 1.5700
3	-3.113 ± 1.0819	0.504 ± 0.7281	4.198 ± 0.8703
4	-3.738 ± 1.5861	-1.953 ± 0.8003	1.920 ± 0.5659
5	-4.359 ± 3.0647	-3.917 ± 0.9753	-1.053 ± 0.4092
6	--	-4.443 ± 1.2879	-3.155 ± 0.4231
7	--	--	-4.987 ± 0.5725

* The effect of weeks and month of conception was significant (P<0.001).

Based on the findings of this study it may be concluded that an earlier pregnancy in dairy buffaloes results in drastic decline in milk yield at an earlier stage as compared to those conceived at later stages. The natural increase in milk yield is prevented by the earlier pregnancy occurrence. A noticeable decline level (about 4 kg/week) was seen on 12th week post-conception. The high yielding buffaloes under the private medium-sized animals are more sensitive to the onset of pregnancy and the resource constrained-poor-unaware farmer is unable to provide sufficient feeding and managemental support to these animals. The dairy buffaloes do not produce on their own cost and manifests an earlier decline in milk yield with the onset of pregnancy, than the cow. The buffaloes conceiving at an earlier stage of lactation were also good milk producer in comparison to their non-pregnant counterparts.

Figure 1. Change in milk yield with the advancement of pregnancy in dairy buffaloes at large-sized state farms.

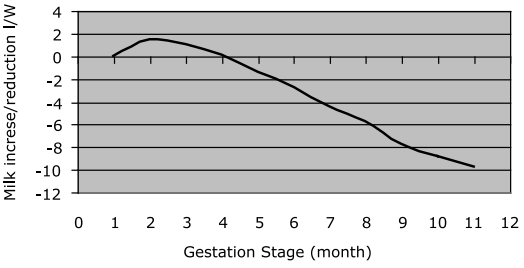
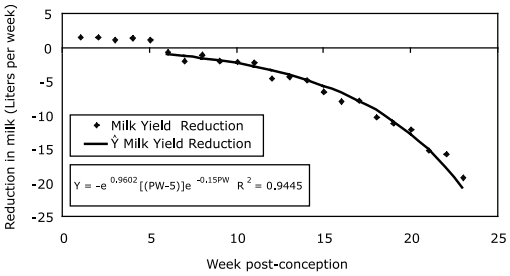


Figure 2. Change in milk yield with the advancement of pregnancy in dairy buffaloes at small-sized private farms.



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