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RESEARCH ARTICLE

Studies on feeding and housing management with economic performance of gaolao strain of Nagpuri Buffalo

S.G. GUBBAWAR, **R.R. SHELKE**, S.D. CHAVAN AND S.R. MUNNARWAR

ABSTRACT - The present investigation was made to assess the feeding management and housing management and to evaluate the economical performance of gaolao strain of Nagpur buffalo breed located in Wardha district. From the observations, it was clearly established that. majority of buffalo owners from all the tahsils allowed their buffaloes to graze in forest area throughout the day *i.e.* practically for 10 hours. With regards to housing practices, it was noticed that none of the buffalo owners provided ideal constructed houses to their buffaloes inspite of the fact that, they were maintaining a sizeable herd. The AFC of gaolao strain was found comparable with other strains of Nagpuri breeds, but was higher than other buffalo breed. On an average, milk and dry days were 263.74 and 146.55 days, respectively. This means the gaolao strains was regular breeder in comparison to other buffalo breeds like Murrah, Mehsana and Surti, the trend therefore indicated that gaolao strain was medium milk producing buffalo with shorter lactation length and dry period.

KEY WORDS - Feeding, Housing, Lactation length, Lactation milk, Dry period, Milk yield

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Author for Correspondence -
R.R. SHELKE
Department of Animal Husbandry and Dairying, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA
See end of the article for **Coopted authors'**

INTRODUCTION.....

Indian dairy farming has unique characters where animal husbandry is an integral part of crop husbandry. The country has 98 and 222 million buffalo and cattle, enjoying the privilege of possessing 57 per cent of world's buffalo and 16 per cent cattle population. Country ranks the first in respect of cattle and buffalo population in the world. Today India ranks the first in the world in milk production, which rose from 17 MT in 1950-51 to around 100 MT by 2006-07. As a result the per capita availability of milk was 230 g/day in 2005-06 and is expected to reach 245 g per day in 2006-07 (Anonymous, 2006).

Buffalo a "Asian animal" plays an important role in farmers economical life, being an integral part of the farming system. Buffalo is economically important in every region. Its milk and meat are rich in nutrients, especially higher fat content and lower cholesterol value. The animal has a ability to digest more crude fibre and higher efficiency of utilization of metabolic energy for milk production than that of high yielding cows (Roy Choudhary, 1988).

Nagpuri breed has its native area in Maharashtra. However it is believed by the people that although the terms Nagpuri, Ellichpuri, gaolao, Shahi, Pandharpuri and Marathwadi are synonymous, but the population do indicate distinct differences in their body confirmation and physical characteristics. Maharashtra state possesses 6.14 million buffaloes which is 6.26 per cent of the buffalo population of India. The Vidarbha region today possessed 0.79 millions buffaloes which comes to 12.70 per cent of the Maharashtra state buffalo population. The buffalo milk production is to the tune of 0.38 million tonnes (Census, 2004 and District Social Survey Report, 2005-06).

The gaolao or Gauli type of buffaloes predominantly spread all over Wardha district. However, gaolao buffaloes are found in large number in Western part of Wardha district

belonging to bank of Wardha river. The name is derived from the vernacular word meaning "belonging to Gauli or professional milk producer". At present about 0.65 lakh buffaloes are found in the Wardha district. The buffalo milk production of the district is about 240.58 lakh kg (Livestock Census, 2004 and District Social and Economical Survey, 2005-06). The buffalo milk rearing is one of the traditional occupations in this district. Because major portion of the geographical area is under forest which offers the grazing facilities to the buffalo owners. The buffalo owners preferred to rear gaolao buffalo on account of its regularity in breeding production of moderate quantity milk with higher fat content and efficiency of coarse fodder conversion by the buffaloes. The present investigation was made to assess the feeding management, to find out the housing management and to evaluate the economical performance of gaolao buffaloes.

RESEARCH METHODS.....

Sampling techniques:

Information with regards to feeding and housing practices and economical characters of 1000 buffaloes were collected from three Tahsils namely, Karanja, Ashti and Arvi of Wardha district. For this purpose, the data on 350, 300 and 350 buffaloes from Karanja, Ashti and Arvi Tahsils, respectively were recorded to make the total sampling on 1000 buffaloes of different 90 buffalo owners

Feeding and housing practices:

The buffalo owners were contacted individually and through personal interview. The information on feeding and housing practices were obtained. Moreover, during personal visit, the practices adopted by them were also observed. On the basis of information collected the data were tabulated and processed so as to arrive certain conclusions.

Economical characters:

The age at first calving, lactation length, lactation milk yield and dry period were calculated on the basis of the information provided by the buffalo owners in personal interview.

Statistical analysis:

The collected data were carefully examined for completeness and correctness before tabulation. The data were further analyzed by keeping in view the objectives of the study. For analysis, simple tabular technique and appropriate statistical methods were employed. After the tabulation of data, frequency distributions were worked out in order to know the distribution of buffalo in different age groups according to their measurement of physical characters. Arithmetic mean, standard deviation, coefficient of variation were worked out to describe the data, as per the procedure given by Amble (1975).

RESEARCH FINDINGS AND ANALYSIS.....

The findings obtained from the present investigation are presented below:

Feeding practices:

The overall body development of animals is dependent on the supply of nutrition to them, besides the genetic make up. Therefore, the feeding practices adopted by buffalo owners were recorded and tabulated in Table 1.

It is evident from Table 1 that majority of buffalo owners were dependent on grazing of buffaloes in forest area. The animals were allowed to graze from 8 a.m. to 6 p.m., practically for 10 hours. Moreover, the buffalo owners located nearby forest area did allow their buffaloes to graze even during night hours. On an average, 67.78 per cent farmer irrespective of Tahsils relied upon grazing practice with the adoption of this pattern by 72.0, 64.0 and 67.50 per cent buffalo owners in Karanja, Ashti and Arvi Tahsils, respectively. Probably, availability of easy approach in forest area might have tempted the owners for grazing on one hand and economical on other hand. Lall *et al*. (1998) observed in the survey of Hisar district that buffaloes producing 2 to 4 kg milk were let loose for grazing for most of the days and were not fed any concentrate. These observations are supportive to present trend. In the present study the milk production level was also 4 kg/day. However, substantial number of 28.0, 36.0, 32.50 per cnt buffalo owners adopted the practice of grazing + stall feeding. These

Table 1: Distribution of buffalo owners according to feeding practices

Feeding practices	N(25) Karanja	N(25) Ashti	N(40) Arvi	Total(90)
Only grazing	18 (72.00)	16 (64.00)	27 (67.50)	61 (67.78)
Grazing + Stall feeding	07 (28.00)	09 (36.00)	13 (32.50)	29 (32.22)
Feeding conc. (g) at milking/day				
Up to 100	02 (8.00)	01 (4.00)	05 (12.50)	8 (8.89)
101-200	03 (12.00)	03 (12.00)	07 (17.50)	13 (14.44)
201-300	16 (64.00)	18 (72.00)	13 (32.50)	47 (52.22)
301-400	04 (16.00)	03 (12.00)	15 (37.50)	22 (24.45)

owners did feed their buffaloes with crop residues during evening hours after the return of buffaloes from grazing. This practice was only possible to the owners possessing the cultivable land. While the landless owners had their thrust on grazing the animals. Akbar *et al.* (1995) expressed that landless labourers were grazing their buffaloes and providing less quantity of cultivated fodder.

With regards to feeding of concentrates to buffaloes, it was noticed that the concentrates were neither fed according to milk production level nor fulfilling the nutritional requirements. Small quantity of concentrate, particularly cotton seed cake were offered piece by piece till the competition of milking process. In general, majority of owners *i.e.* 64.0, 72.0 per cent, respectively from Karanja and Ashti Tahsils fed their buffaloes about 201 to 300 g. Cotton seed cake per day per buffalo. In contrast, 32.50 and 37.50 per cent buffalo owners from Arvi Tahsil had a practice of feeding 201 to 300 and 301 to 400g. cotton seed cake per day per buffalo, respectively. It is already pointed that, the average milk production of buffaloes from Arvi Tahsil was more as compared to other two Tahsils. Therefore, this could be the reason for feeding more concentrate to buffaloes in Arvi Tahsils against other two places. Thus, it is difficult to draw any conclusion about the nutritional status of the buffaloes in the present study. However, it can be expected that grazing in forest area might have provided sufficient fodder to buffaloes. Moreover, Malik and Nagpaul (1998) and Deoras *et al*. (2004) opined that the animal owners either from rural area or urban area were dependent most on grazing. These views confirm the present trend.

Housing practices:

The data of 1000 gaolao buffaloes were collected from 90 buffalo owners located in 3 Tahsils of the district. About 62.40 per cent of the buffalo owners possessing a couple of hectare of land while substantial number of owners (37.54%) were landless. It is already pointed out that the study area had more land under forest and hilly area. As a result the cultivable land owned by the owners was undulating and therefore, maximum land was under rain fed crops. On this background situation the housing facilities provided by the buffalo owners to their animals are ascertained and tabulated in Table 2.

It was observed that none of the buffalo owner provided ideal constructed housing to their buffaloes inspite of the fact that they were maintaining a sizeable herd. Similar opinion was given by Raut (1982 and 1982a) while studying housing condition to buffaloes in Dhule region of Maharashtra. Majority of the owners preferred loose housing pattern on hilly portion outside the village nearer to forest area. In this system the animals were kept in loose condition in open area by providing a simple wooden enclosure. About 60.00 per cent, 44.00 and 37.50 per cent of the buffalo owners preferred this type housing in Karanja, Ashti and Arvi Tahsils, respectively against provision of Kacha close shed by 8.0, 8.0 and 27.50 per cent farmers in Karanja, Ashti and Arvi Tahsils,

Table 2: Distribution of buffalo owners according to housing conditions

Sr. No.	Category	Karanja (25)	Ashti (25)	Arvi (40)	Poold (90)
1.	**Type of housing**				
	Kutcha close shed	02 (8.00)	02 (8.00)	11 (27.5)	15 (16.67)
	Side of the house	02 (8.00)	04 (16.00)	09 (22.5)	15 (16.67)
	Loose housing	06 (24.00)	08 (32.00)	05 (12.50)	19 (21.11)
	Loose housing as hilly portion ouside village	15 (60.00)	11 (44.00)	15 (37.50)	41 (45.55)
2.	**Type of flooring**				
	Kutcha (mudy levelled)	02 (8.00)	02 (8.00)	11 (27.50)	15 (16.67)
	Spreading muroom	02 (8.00)	04 (16.00)	09 (22.50)	15 (16.67)
	Natural muddy (ground)	21 (84.00)	19 (76.00)	20 (50.00)	60 (66.66)
3.	**Level of floor**				
	Sloppy	01 (4.00)	02 (8.00)	05 (12.50)	08 (8.89)
	Leveled	-	-	06 (15.00)	06 (6.67)
	Uneven	24 (96.00)	23 (92.00)	29 (72.50)	76 (84.00)
	Total				
4.	**Type of wall**				
	Brick	-	-	12 (30.00)	12 (13.33)
	Earthen	-	11 (44.00)	13 (32.50)	24 (26.67)
	Local wooden material	25 (100.00)	14 (56.00)	15 (37.50)	54 (60.00)

(Figures in parenthesis indicates percentage of total)

respectively. Perhaps the better socio-economic condition of Arvi Tahsil owners might have allowed them for the provision of close houses as compared to other two tahsils.

The another system of housing noticed in sizeable number of owners was keeping the animal out side the house in open area in enclosure made of wooden bellies while few farmers preferred to keep the buffaloes under side roof of the house enclosed on two sides with wooden poles Shastry and George (1988) also noticed in Ludhiana city that housing of buffaloes in human dwellings or in partially opened shed supporting to present results. It was further observed that on an average, majority of the buffalo owners (66.66%) did not take any efforts for providing floor. Hence, the floor was natural condition ground. While 16.67 per cent owners prepared the floor by spreading the muroon on ground and remaining 16.67 per cent owners made effect to prepare the floor in leveled condition called Kacha floor. In respect of flooring condition among locality, it was noticed that majority of buffalo owners (84.00, 76.00 and 50.00%) from Karanja, Ashti and Arvi Tahsils, respectively did not care about the floor. As result natural muddy uneven ground was the floor. This trend appears obvious as maximum buffalo owners from these tahsils adopted the system of loose housing on hilly area. However, substantial number of owners (27.50 and 22.50%) from Arvi Tahsil provided either Kucha leveled muddy floor or floor spread over with muroom. With regards to type of wall in close shed and side of the house, it was observed that provision of brick with mud walls was adopted only by the 30 per cent owners in Arvi Tahsil. While 44.0 and 32.50 per cent buffalo owners from Ashti and Arvi Tahsils erected the side wall of the close shed with the help of mats prepared from cotton and tur stock with mud plastering. In contrast, all the buffalo owners from Karanja tahsil adopted the practice of local wooden material for the erection of walls.

The significant observation was that none of the buffalo owners made the provision for collecting the liquid waste from the buffalo. The urine excreted by the animal allowed to absorb in soil. However, the dung was collected and a heap was prepared on one side of the house. Other cleaning measures were not adopted by them. Shastry and George (1988), Deoras *et al*. (2004) also observed improper drainage in housing under village condition. These views are supportive to present trend. Similarly provision of mangers was also not the practice in the study area. Probably the practice of grazing the buffaloes in forest area throughout the day might not have found necessity about the manger. However, Bidwe (2004) reported the availability of wooden manger in buffalo sheds in Buldana district of Maharashtra. This trend do not agree with present results.

Economical characters:

The overall development of the animal is related with the expression of different economical characters. In past, it has been established that body measurements did indicate correlation with different economic characters. With this view the important productive character were studied for gaolao buffaloes and discussed below.

Effect of locality:

The effect of locality on important productive character like age at first calving, milk production, milk days and dry days were studied. The observations in this respect are given below.

Age at first calving (AFC):

A reference to Table 3 indicates that on an average the age at first calving in gaolao buffaloes irrespective of locality was 55.22 months. The variability in the population was less on the basis of coefficient of variation (4.15%). This means the locality did not show a notable impact on age at first calving. The AFC was 55.488, 55.623 and 54.983 months in buffaloes confined to Karanja, Ashti and Arvi Tahsils, respectively. In the absence of records the information on AFC was collected from the owners. It is therefore possible that all the owners supplied a tentative information which might not have differed between the locality. The AFC in Nagpuri buffaloes reported by Khire *et al*. (1977), Shrikhande *et al*. (1998) and Tiwana and Dhillon (1998) are supportive to present value. They observed AFC in Nagpuri buffaloes between 54 to 55 months. On the other hand the AFC in Pandharpuri (44.44 months) reported by Ulmek (2002) is sufficiently lower than the present value.

Milk production :

It is evident from Table 3 that, the milk production in buffaloes differed substantially between the locality. On an average, it was 950.285, 917.00 and 1023.714 kg per buffalo per lactation in Karanja, Ashti and Arvi locality, respectively. The present trend clearly indicated that, the gaolao buffaloes confined to Arvi locality produced more milk followed by Karanja and Ashti locality.

Moreover, the pooled average milk production was 966.00 kg per lactation with 22.51 per cent coefficient of variation value. This trend clearly demonstrated that gaolao buffaloes are fairly good milkers. The observations recorded earlier by Raghavan (1960), Kaura (1961) that Nagpuri buffaloes were fairly good milkers which confirms the present trends. On the other hand the milk production reported by Kalyankar (2003) and Patange *et al*. (2004) for Marathwadi buffalo higher by 180 kg over the milk production of gaolao buffaloes. However, the milk production reported by Patel and Tripathi (1998) for Surti, Kuralkar and Raheja (2000) for Murrah, Bharat *et al*. (2003) for Surti and Mehsana, Singh *et al*. (2003) for Murrah buffaloes were substantially higher than

Table 3: Effect of locality on means of different economic characters in gaolao strain of Nagpuri buffalo breed

Sr. No.	Character		Karanja	Ashti	Arvi	Pooled
1.	Age at first calving (AFC) month	Average	55.488	55.623	54.983	55.226
		SE(m)±	0.0931	0.117	0.111	0.725
		CV %	3.26	0.80	3.80	4.15
2.	Milk production (kg)	Average	950.285	917.00	1023.714	966.00
		SE(m)±	10.610	10.761	13.154	6.886
		CV %	20.90	20.32	20.37	22.51
3.	Lactation length (days)	Average	265.100	264.919	261.229	263.749
		SE(m)±	0.452	0.489	0.347	0.196
		CV %	3.59	3.60	2.80	3.44
4.	Dry period (days)	Average	146.14	143.283	140.157	146.55
		SE(m)±	0.554	0.489	0.312	0.274
		CV %	7.70	6.47	4.49	6.55

the milk production of gaolao buffaloes. In contrast, the milk production of Chilika buffaloes, Sambalpuri buffalo and Bhadawari buffalo reported by Dasburma *et al*. (2002), Mahapatra *et al*. (2002), Pundir and Ahlawat (2004), respectively are nearer to the present milk production level of gaolao buffalo. Thus, the data on milk production of gaolao buffalo clearly indicated that, the buffaloes would produce less milk than that of a breeds of buffalo like Murrah, Surti and Mehsana.

Lactation length:

A perusal of Table 3 indicates that the lactation length in gaolao buffalo did not exhibit much variation between the locality. On an average it was 265.00, 264.919 and 261.229 days in buffaloes of Karanja, Ashti and Arvi locality, respectively. However, the lactation length reported by Thokal (1985), Khire *et al*. (1987), Ballewar (1987), Giri (1987), Chafle (1992), for Nagpuri, Ellichpuri and Purnathadi buffalo strains were comparatively higher than the present values. They reported from 288 to 315 milk days in different strains of Nagpuri buffalo breed.

On the other hand, the average lactational length reported by Mahapatra *et al*. (2002) for Sambhalpuri, Gajbhiye *et al*. (1992) for Mehsana, Narasimharao and Sreemannarayana (1994) for Murrah were also much higher than the lactational length noticed in the present study in gaolao buffalo. Thus, it can be said that the lactational days in gaolao strain were lower as compared to the strains of Nagpuri buffalo breed as well as that of other buffalo breeds.

Dry days:

It is seen from Table 3 that the dry days did not differ much between the locality. It was 144.14, 143.283 and 140.157 days for buffaloes habitats in Karanja, Ashti and Arvi localities. This trend appears obvious as the variation within and between the locality was less on the basis of coefficient of variation value, being ranging from 4.49 to 7.70 per cent. The overall dry period in gaolao strain of Nagpuri buffalo was 146.55 days. This dry period appears lower than that reported by Giri (1987) for Purnathadi, Chafle (1992) for Ellichpuri and gaolao type, Shrikhande *et al*. (1998) for Nagpuri and Patange *et al*. (2004) for Marathwadi buffalo. The calving interval reported by Kuralkar and Raheja (1997) for Murrah, Sule *et al*. (2001) for Surti, Gajbhiye and Patel (2003) for Mehsana and Pundir and Ahlawat (2004) for Bhadawari and Mehsana, were more than that of calving interval noticed in gaolao buffalo i.e. 263.749 lactation length and 142.655 dry period is equal to 606.404 days calving interval. However, the calving interval reported by Khire *et al* (1987) for Nagpuri and Ulmek (2002) for Pandharpuri buffaloes are supportive to the present observations. But the calving interval observed by Dhande *et al*. (1985) for Nagpuri, Chafle (1992) for Ellichpuri and gaolao, Kalyankar *et al*. (2003) for Marathwadi buffaloes were higher by 40 to 90 days as compared to present value. Thus, from the dry period observations, it can be said that gaolao buffaloes were regular breeder as compared to other strains of Nagpuri breed as well as other buffalo breeds of the country.

Effect of age groups :

The effect of age of the buffalo on productive characters like milk production, lactation length and dry period were ascertained for 4-5, 6-7, 8-9 and above 10 years age groups. The results are discussed as follows:

Milk yield:

The data on average milk yield in gaolao strain of Nagpuri buffalo breed as influenced by age groups have been shown in Table 4 and the analysis of variance Table 4(a).

It was observed that the milk yield per lactation was ranging from 871.75 to 958.00 kg per buffalo irrespective of

Table 4: Average milk yield (kg) in gaolao strain of Nagpuri buffalo breed

Groups	Year	Number	Min.	Max.	Average	SE(m)±	CV%
I	4-5	220	605	700	653.68	4.88	5.28
II	6-7	282	910	999	958.94	4.07	3.00
III	8-9	150	1120	1234	1167.38	4.64	2.81
IV	10 & Above	248	852	899	883.54	1.70	1.36
	Pooled average		871.75	958	915.88	3.82	

Means with similar superscript Column do not differ significantly

Table 4(a): Analysis of variance for milk yield (kg)

Source	d.f.	MSS	SE(m)±	CD	CV%
Treatment	3	2248352**	0.235	0.65	6.43
Error	996	3468.38			

**indicates significance of value at P=0.01

Table 5: Average lactation length (days) in gaolao strain of Nagpuri buffalo breed

Groups	Year	Number	Min.	Max.	Average	SE(m)±	CV%
I	4-5	220	231	250	241.66	0.74	2.16
II	6-7	282	250	270	259.96	0.87	2.37
III	8-9	150	270	280	275.16	0.41	1.07
IV	10 & Above	248	270	280	274.74	0.39	1.02
	Pooled average		255.25	270.00	262.88	0.60	

Means with similar superscript Column do not differ significantly

Table 5(a): Analysis of variance for lactation length

Source	d.f.	MSS	SE(m)±	CD	CV%
Treatment	3	12504.54**	0.037	0.10	3.56
Error	996	87.64			

**indicates significance of value at P=0.01

Table 6: Average dry period in gaolao strain of Nagpuri buffalo breed

Groups	Year	Number	Min.	Max.	Average	SE(m)±	CV%
I	4-5	220	121	135	129.98	0.57	3.11
II	6-7	282	131	145	139.02	0.57	2.92
III	8-9	150	130	150	143.02	0.76	3.80
IV	10 & Above	248	150	160	155.54	0.40	1.83
	Pooled average		133.00	147.50	141.89	0.57	

Means with similar superscript Column do not differ significantly

Table 6(a): Analysis of variance for dry period

Source	d.f.	MSS	SE(m)±	CD	CV%
Treatment	3	5620.13**	0.034	0.09	6.11
Error	996	75.35			

**indicates significance of value at P=0.01

age group with an average production of 915.88 kg. Moreover, the age of animal influenced significantly the milk yield in buffaloes. It was minimum (653.68 kg) in 4-5 years age which reached to maximum of 1167.38 kg during 8-9 years age and again declined to 883.54 kg after ten years. This means the milk production was less during first lactation and increased with increase of lactational number. This trend appears obvious as the animal reached to its peak production in third lactation. Similar views were expressed by Gill *et al*. (1970), Patro and Bhat (1979), Khire *et al*. (1987) and Giri (1987) which

support to the present trend.

Lactation length:

It is evident from Table 5 that the pooled lactation length in gaolao buffaloes was 262.88 days with a range of 255.25 to 270.00 days. This means irrespective of age group, the period of milk production in the gaolao strain of Nagpuri buffalo was hardly 8 to 9 months. This lower lactation length might be the reason for lower milk production in buffalo. Moreover, it was also observed that the lactation length was affected significantly by the age group of the animal. The minimum lactation length of 241.66 days was noticed in 4-5 age group and a maximum of 275.16 days in 8-9 years group. However, Khire *et al*. (1993) observed no significant effect of parity on lactation length character in Nagpuri buffalo which does not agree with present trend of gaolao buffalo.

Dry period:

It is evident from Table 6 that the dry period in gaolao strain of Nagpuri buffalo breed was ranging from 133.00 to 147.50 days with an average period of 141.89 days. This trend appears obvious on the contention that, the breeding efficiency decreased with the older age. On an average the dry period was 129.98, 139.02, 143.02 and 155.54 days in 4-5, 6-7, 8-9 and above ten years age group, respectively.

Thus, the results on economical characters of gaolao strain of Nagpuri buffalo breed clearly established that the gaolao strain was medium producing animal with short lactation and dry period. Hence, could be considered as an economical animal.

Conclusion:

From the observations of the present study it was clearly established that. majority of buffalo owners from all tahsils allowed their buffaloes to graze in forest area throughout the day *i.e*. practically for 10 hours. Hardly 32.22 per cent buffalo owners adopted the practice of grazing and stall feeding with crop residues. With regards to housing practices, it was noticed that none of the buffalo owners provided ideal constructed houses to their buffaloes inspite of the fact that, they were maintaining a sizeable herd. Majority of the owners from 3 Tahsils preferred loose housing pattern on hilly portion outside the village nearer to forest area. The AFC of gaolao strain was found comparable with other strains of Nagpuri breeds, but was higher than other buffalo breed. On an average milk and dry days were 263.74 and 146.55 days respectively. However, the productive characters were influenced significantly by the age group of buffalo. The buffalo from 4-5 year age group produced 653.68 kg milk in 241.66 days while the production was maximum during 8-9 years age group, being 1167.38 kg in 275.16 days. The average dry period was 129.98, 139.02, 142.02 and 155.54 days in I, II, III and IV groups respectively. This means the gaolao strains was regular breeder in comparison to other buffalo breeds like Murrah, Mehsana and Surti, the trend therefore indicated that gaolao strain was medium milk producing buffalo with shorter lactation length and dry period.

COOPTED AUTHORS' –

S.G. GABBAWARR, S.D. CHAVAN AND S.R. MUNNARWAR, Department of Animal Husbandry and Dairying, Dr Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA

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