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Studies on Exposure Time for Freeze Branding using Copper and Brass Metal in Sahiwal Cattle

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A B S T R A C T

The present investigation was conducted at the Bull Mother Experimental Farm, College of Veterinary Science & A.H., Anjora, Durg. Age group of Sahiwal cattle 0 to 6 and 6 to 12 months, the days required for appearance of white hairs was relatively lesser (43.33±1.20 and 42.8±4.93 days) at 7 and 8 seconds, respectively for copper metal during freeze branding. In 12 – 18 months of age group, minimum days (55.5±6.54) required for appearance of white hairs were seen at 18 seconds of exposure time using brass metal. The 100 percent legibility of white hairs in 0 to 6 months of age group for copper metal, whereas, age group of 6 to 12 months, the 100 percent legibility of white hairs was seen for both the metals. The weak legibility of white hairs was seen in above 18 months of age group which can be attributed to the thickness of skin of animals which may have become thicker with advancement of age. Brass metal was better than copper metal as 5 per cent animals scored 5. Hence, on the basis of score points, it was concluded that brass metal is better for all age group over copper metal. The mean value of neutrophils, before and after freeze branding, was 20.28±1.62 and 22.62±2.47%, respectively within the normal range and could not be an indication of stress associated with freeze branding.

Introduction

Proper identification of animals is a key of record keeping leading to improve management of a herd. Identification of animal in livestock enterprise is of immense importance to draw conclusion of their status in production as well as performance. Individual animal identification will allow producers to keep records of an animal's parentage, birth rate, production records, health history, to keep a watch on animals expected to be in heat on a given day, to dry off, to cull to perform AI and to get other important management information required to study status of farm. Marking of cattle for identification should involve methods that are easy to read at a distance, easy to apply,

permanent, durable and economic. There are several methods in vogue to identify the animal though none of them is flawless and foolproof (Mishra *et al.*, 2005). The several methods of identification, freeze branding is a method of livestock identification, which is less stressful to animals (Lay *et al.*, 1990) and has been accepted widely in developed countries. Freeze branding offers a permanent form of identification i.e. easy to read at a greater distance, cause minimal damage to the hide and is less painful than hot branding (Lay *et al.*, 1992 and Schwartzkopf-Genswein *et al.*, 1997). This method resulted in destruction of pigment cells resulting in a white haired patch on the skin of Sahiwal. The Sahiwal is one of the best dairy breeds in India. The colour of Sahiwal is red. The white hair appearing on the skin will be permanent and remain easily readable. The present study was designed to observe the best exposure time of copper and brass metal for effectiveness of freeze branding.

Materials and Methods

Present study was conducted on 80 Sahiwal cattle of different age groups at the Bull Mother Experimental Farm, College of Veterinary Science & A.H., Anjora, Durg. Each group comprised of 20 animals (Table 1). The age of animals ranged from 0 month to above 18 months (Hall *et al.*, 2004). The branding metal (copper and brass) is an important instrument which acts as a medium to expose the required temperature to the skin of animals whereas, by various workers (Farrell *et al.*, 1966 and Whitter *et al.*,1993) assessed copper metal but present studies on freeze branding comparison with brass metal. The shape of metal was moulded to "I" shape and the width and depth (face to back) of metal brand are same for all age group of animals where as length and weight was different on the basis of age group of animals (Bath *et al.*, 1981). The liquid nitrogen was used as refrigerant. The temperature of it is nearly to -196^0C and remains as liquid in that temperature (Key *et al.*, 1977 and Wagner *et al.*, 2000). The frosted branding metal was quickly applied on the skin of the cattle with firm pressure by holding the metal on the area and do not let it slip. Freeze branding experiment conducted mostly on exotic breed but there is no evidence for the indigenous breed i.e. Sahiwal, as well as no evidence of exposure time for freeze branding in Sahiwal, so we observe appearance of white hairs, legibility of white hairs, scoring system (Table 2) for selection of metal at different exposure times for different age groups (Farrell and Potter, 1966, Hall *et al.*, 2004, Hooven *et al.*, 1971 and McMahon *et al.*, 2006) and also find haematological parameter were recorded to observe the stress occurred due to this method. To see the effectiveness of branding by different exposure times in different age groups one way analysis of variance was applied (Snedecor and Cochran, 1994) and any significant difference exist in any group then DMRT was applied (Steel and Torrie, 1984).

Results and Discussion

Appearance of white hairs

In 0-6 months age group, the average time for appearance of white hairs on the skin in present investigation was found to be 45.6±1.96 and 50.93±1.3 days for copper and brass metals, respectively (Table 3). The minimum and maximum time being 43.33±1.20 and 55.25±1.75 days, respectively. Relatively, lesser time was seen for the appearance of white hairs at 7 to 9 seconds (43.33±1.20 and 43.4±4.26 days respectively) using copper metal. However all the values were non-significantly different with respect to both metals and exposure times used in present studies. Similar results were found by Sherwin *et al.*, (2002) (Fig. 1).

In 6-12 months category an average time of 48.33±2.46 and 50.2±1.42 days, respectively for copper and brass metal were observed for appearance of white hairs on skin following freezing (Table 3). The minimum and maximum days required for appearance of white hairs were 42.8±4.93 and 58±2.08 days respectively. However, these results were in agreement with the findings of Bath *et al.,* (1981) and Bertram *et al.,* (2006), where they observe 6 weeks for the appearance of white hairs growth.

In Sahiwal, the average time for appearance of white hairs on skin were 58.09±1.34 and 58.9±2.44 days, respectively for copper and brass metal (Table 3) with minimum and maximum days being 55.5±6.54 and 62.5±2.5 days, respectively in 12-18 months category. In this age group, minimum of 55.5±6.54 days required for appearance of white hairs were seen at 18 seconds of exposure time using brass metal. However, all the values did not differ significantly with respect to all exposure time and metals used in present investigation of 12 to 18 months age group. Similar findings were observed by Bath *et al.,* (1981) and Bertram *et al.,* (2006).

Above 18 months of age group, the average time of appearance of white hairs on skin were 58±2.32 and 58.7±2.56 days, respectively for copper and brass metal (Table 3). However, the minimum and maximum values for appearance of white hairs varied from 47±00 to 64±2.0 days for all types of metal. The difference in the time required for appearance of white hairs in all exposure time of above 18 months age groups of copper and brass metals were non-significant. These findings were in accordance with the findings of Sherwin *et al.,* (2002). Overall, a trend was noticed that relatively more days were required for appearance of white hairs with the advancement of age.

Legibility of freeze brand

In 0-6 month's category, the legibility of white hairs for copper metal varies from 60 to 100 per cent. For brass metal the legibility varies from 60 to 80 per cent inspite of non-significant difference (χ^2=0.798) among them (Table 4). However, the chi-square value indicated non-significant difference between the legibility of white hairs and various exposure times. Although 100 per cent legibility was observed in 9 and 7 seconds of exposure time using copper whereas 80 per cent legibility was observed in 5, 9 and 11 seconds of exposure time using brass metal is also acceptable.

In 6-12 months of age group, the legibility of white hairs for copper metal varied from 60 to 100 per cent. In case of brass the legibility varied from 60 to 100 per cent, in spite of this no significant difference (χ^2= 2.5) among them was noticed (Table 5). In copper metal, the chi-square value (χ^2=2.932) indicated non-significant difference between legibility of white hairs with respect to their exposure time. The copper metal has given 80 to 100 per cent result at 11 to 8 seconds of exposure time. Similar results were observed in brass metal where 80 to 100 per cent legible white hairs were observed at 17 to 8 seconds of exposure time.

The chi-square values were 0.601 and 2.219 for copper and brass metal, respectively in 12-18 months category. Overall the minimum and maximum value of frequency (in percentage) of legible white hairs varied from 40 to 80 percent in both metal. In copper metal, the legible white hairs appeared less than 80 percent and were non-significant (χ^2=0.601). Whereas in brass, the legibility varied from 40 to 80 per cent in spite of having significant difference (χ^2=2.219) between for all the exposure time (Table 6).

Above 18 months of age group, the chi square value was 2.414 for both metals. Overall minimum and maximum frequency (in percentage) of animals for white hairs varied from 20 to 60 per cent in both metals (Table 7). The chi square values indicated non-significant difference with respect to all the exposure time. In spite of this, the appearance of white hairs in this age group (more than 18 months) was less than 80 percent; hence, legibility may be ambiguous after 18 months of age.

Selection of metal

In case of score 3, 4 and 5 the developed white brand were for copper (25, 25 and 15% animals, respectively) and for brass (25, 10 and 20% animals, respectively) in 0-6 months category. At score 5 maximum percentage of instantly recognizable number was observed in brass metal (20 per cent) followed by copper metal (15 per cent) (Table 8). These findings are in agreement with the results reported earlier by Thrift *et al.*, 1971.

In 6-12 months of age group 25, 15, 45 and 15 per cent animals had scored 1, 2, 3 and 4, respectively for copper metal. In case of brass metal 20, 20, 45 and 15 per cent animals respectively scored 1, 2, 3 and 4. Maximum percentage (45 percent) of animals scored 3 in both metals (Table 8) and after score 3 marked reduction in visible white hairs was observed in score 4, as known for better visibility of white hairs. In 12-18 months category copper metal (45, 20, 25 and 10% animals) and brass metal (45, 20, 30 and 5% animals) had score of 1, 2, 3 and 4, respectively (Table 8). Overall, 10 percent animals contained visible hairs, when copper metal was used, which is higher that of brass (5 percent) considering score 4 higher visibility was noticed in copper metal than that of brass metals. However, differences among metals were non-significant.

Table.1 Different exposure time proposed for different age group

Age (months)	No. of Animal		Exposure time (seconds)
0-6	20	5	5
		5	7
		5	9
		5	11
6-12	20	5	8
		5	11
		5	14
		5	17
12-18	20	5	12
		5	15
		5	18
		5	21
Above 18	20	5	17
		5	20
		5	23
		5	26

Table.2 The scoring system

Score	Interpretation
1	No visible numbers
2	Visible numbers, but illegible.
3	Incomplete numbers, but able to understand.
4	Easily recognizable numbers, but with breaks or unbranded areas.
5	Instantly recognizable, complete unbroken numbers.

Table.3 Mean time for appearance of white hairs using various metals of same dimension in a given exposure time for Sahiwal cattle

Age Group (month)	Exposure Time (Seconds)	Appearance of white hairs (days)	
		Copper	Brass
0 - 6	5	45±6.35	49±1.83
	7	43.33±1.20	50.66±2.33
	9	43.4±4.26	48.75±3.94
	11	50.5±2.10	55.25±1.75
6 - 12	8	42.8±4.93	47.2±2.4
	11	46.75±5.02	49.75±1.75
	14	50±1.15	56.66±2.40
	17	58±2.08	49.66±3.28
12 - 18	12	57.66±1.45	59±1.00
	15	60±2.00	61±2.65
	18	58±4.73	55.5±6.54
	21	57.33±2.33	62.5±2.50
Above 18	17	63.5±3.5	63±00
	20	52.33±2.03	47±00
	23	62±00	57.66±2.96
	26	60±00	64±2.00

Table.4 Mean value of frequency (in percentage) of legible white hairs on the animals in 0 to 6 months age group of Sahiwal cattle

Exposure Time (Seconds)	Frequency of legible white hairs (percentage)	
	Copper (%)	Brass(%)
5	60	80
7	60	60
9	100	80
11	80	80
Chi square	2.932	0.798

Table.5 Mean value of frequency (in percentage) of legible white hairs on the animals in 6 to 12 months age group of Sahiwal cattle

Exposure Time (Seconds)	Frequency of legible white hairs (percentage)	
	Copper (%)	Brass (%)
8	100	100
11	80	80
14	60	60
17	60	80
Chi square	2.932	2.5

Table.6 Mean value of frequency (in percentage) of legible white hairs on the animals in 12 to 18 months age group of Sahiwal cattle

Exposure Time (Seconds)	Frequency of legible white hairs (percentage)	
	Copper (%)	Brass (%)
12	60	40
15	40	60
18	60	80
21	60	40
Chi square	0.601	2.219

Table.7 Mean value of frequency (in percentage) of legible white hairs on the animals in above 18 months age group of Sahiwal cattle

Exposure Time (Seconds)	Frequency of legible white hairs (percentage)	
	Copper (%)	Brass (%)
17	40	20
20	60	20
23	20	60
26	20	40
Chi square	2.414	2.414

Table.8 Scores and percentage of animals for both metals

Age Group (month)	Score point	Frequency (in percentage) of animals in different metals	
		Copper	Brass
0 - 6	**1**	20	30
	2	15	15
	3	25	25
	4	25	10
	5	15	20
6 – 12	**1**	25	20
	2	15	20
	3	45	45
	4	15	15
	5	-	-
12 – 18	**1**	45	45
	2	20	20
	3	25	30
	4	10	5
	5	-	-
Above 18	**1**	65	65
	2	15	15
	3	15	20
	4	5	-
	5	-	-

Table.9 Overall classification of all the animals (in percentage) on the basis of score points for copper and brass metal

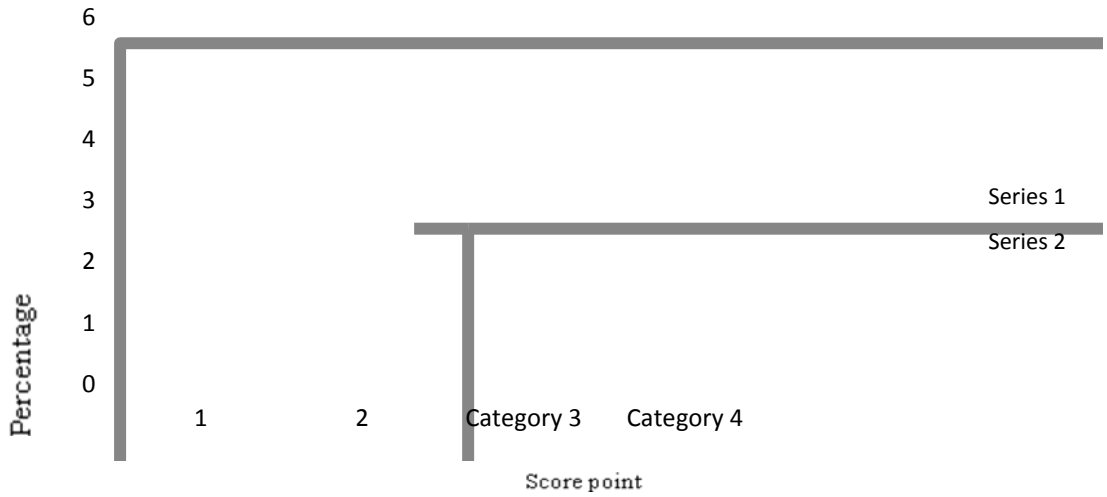
Score point	Metal	
	Copper	Brass
1	38.75	40
2	16.25	17.50
3	27.50	30
4	13.75	7.5
5	3.75	5

Table.10 Mean ± SE change in Haematological parameters before and after freeze branding in Sahiwal

S.No.	Haematological Parameter	Before branding	After branding	Significans
1.	TEC (10^6/µl)	6.53±0.33	6.54±0.22	NS
2.	Hb (gm %)	8.62±0.53	8.40±0.44	NS
3.	PCV (%)	28.20±2.0	28.60±1.0	NS
4.	TLC (10^3/ µl)	5.71±0.45	8.25±0.6	NS
5.	Neutrophils	20.28±1.62	22.62±2.47	**
6.	Lymphocytes	57.42±2.83	59.54±2.40	*
7.	Monocytes	6.26±0.52	6.42±0.73	*
8.	Eosinophils	10.58±0.99	11.06±0.80	NS
9.	Basophils	0.12±0.10	0.22±0.13	**

Values superscripted by different letters differed significantly from each other in a column
*P<0.05**P<0.01NS=non-significant

Fig.1 Frequencies (in percentage) for scores of white hairs for copper and brass



In 12 – 18 months of age group, minimum days (55.5±6.54) required for appearance of white hairs were seen at 18 seconds of exposure time using brass metal. The differences in the time required for appearance of white hairs in all exposure time of above 18 months age groups of copper and brass metal were non-significant.

Overall, age group of 0 to 6 and 6 to 12, the 100 percent legibility was seen in exposure time 9 (copper) and 8 (copper, brass) seconds of exposure time, respectively. Therefore, copper and brass metal could be recommended for respective age group whereas, age group of 12 to 18, the 80 percent legibility was seen in exposure time 18 seconds for brass metal. Therefore, brass metal could be recommended (Table 9 and 10).

The weak legibility of white hairs was seen in above 18 months of age group which can be attributed to the thickness of skin of animals which may have become thicker with advancement of age (Hamid *et al.*, 2000). Perhaps increase in weight of metals could have given better legibility of white hairs.

Overall efficiency of brass metal was better than copper metal as 5 per cent animals scored 5. Hence, it was concluded that brass metal is better.

Farrell (1967) and Torell *et al.*, (2001) who observed that copper to be more efficiently use with more success than brass, steel and aluminium. But in present investigation, brass metal could give better results.

The lymphocytes and monocytes have showed significant rise ($P<0.05$) whereas, neutrophils and basophils were also increased significantly ($P<0.01$), but above results were within the normal range and could not be an indication of stress associated with freeze branding.

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