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ORIGINAL RESEARCH

Socio-economic status of horse owners *vis-a-vis* horse feeding and management in Rajasthan

Yash Pal, R. A. Legha, R. K. Dedar and P. A. Bala

National Research Centre on Equines,
Post Box no 60, Hisar – 125001, Haryana, India
Corresponding author: Yash Pal, email : yashpal1888@gmail.com
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Abstract

Aim: To study the socio-economic status, horse feeding and management adopted by horse owners of Rajasthan.

Materials and Methods: Primary data was collected through specially structured proforma by personal interview method from the horse owners of Hanumangarh (50), Churu (42), Jhunjhunu (30) and Jalore (40) districts of Rajasthan, India.

Results: The district (Churu and Jhunjhunu) is mostly rain fed, Hanumangarh is canal-irrigated whereas Jalore is tube well irrigated. Majority of respondents engaged in horse rearing were of other backward class (OBC) & general category. Literacy (%) among the horse owners was more than 80% in Hanumangarh and Jhunjhunu districts, whereas it was less than 50% in Churu and Jalore districts. Majority of the respondents were maintaining other livestock along with the horses. The average dry roughages provided were 4.82±0.22, 8.143±0.348, 5.267±0.69 and 6.105±0.196kg per horse in Hanumangarh, Churu, Jhunjhunu and Jalore, respectively. The average concentrate offered was 2.81±0.138, 2.452±0.145, 2.933±0.160 and 1.950±0.200kg per horse in Hanumangarh, Churu, Jhunjhunu and Jalore, respectively. It was observed that horse owners were providing green fodder, dry roughages and concentrate depending up on the availability/production of these items in that region. Majority of horse owners were allowing covering of estrus mares between 3rd and 5th day of estrus. Paucity of quality stallions for covering the mares was observed throughout the area surveyed. The respondents had to pay between Rs. 1100/- to 5100/- as covering fee with no guarantee of conception. Most of mares were rebred during foal heat and majority of the respondents were not aware about the symptoms of estrus mare. Vaccination, insurance and use of disinfectants were not adopted in the study indicating the least awareness among the horse owners about the importance of vaccination, insurance and disinfectants.

Conclusion: Horses were being maintained for ceremonial purposes and breeding, their feeding in terms of fodder (green & dry) and concentrate were observed area specific and were fulfilling the minimum nutrient requirements. There was paucity of true to breed stallions in the areas studied.

Key words: feeding, horse, housing, management, socio economics, Rajasthan

Introduction

Horses are used as draught animals in many parts of world On the basis of their geographical localization; two breeds of horses (Marwari and Kathiawari) and ponies (Bhutia, Spiti, Manipuri and Zanskari) have been characterized in India [1]. Although, horses of Marwari, Kathiawari and non-descript (Nukra and Sindhi) are reared in Rajasthan, but horses of Marwari breed are majestic in look and are pride of Rajasthan. The breeding tract of this breed is Jodhpur, Udaipur, Jalore, Nagore, Pali, Sirohi, Barmer, Jaisalmer and Rajsamand districts of Rajasthan. As per livestock census 2007, there are 24,564 horses in Rajasthan [2] and they are mainly used for ceremonial purposes, safari, riding, patrolling, equestrian events and breeding. Hardly any literature on socio-economic status of horse owners as well as feeding and other management practices adopted by the horse owners of Rajasthan is available.

Hence, the study was planned to know socio-economic status, horse feeding and management adopted by horse owners of Rajasthan, India.

Materials and Methods

The horse populated villages of Hanumangarh, Churu, Jhunjhunu and Jalore district were randomly selected for the survey. Primary data was collected through specially structured proforma by personal interview method from the horse owners belonging to Hanumangarh (50), Churu (42), Jhunjhunu (30) and Jalore (40) district of Rajasthan. The data included the general information about the horse owners, their source of earnings, family inventories, land holdings, equine herd strength, other livestock herd strength, reproductive and health management, feeding and housing practices and other constraints regarding the growth and development of the this enterprise in the region.

Statistical analysis: Statistical analysis was performed as per Snedecor and Cochran [3] and Duncan's multiple range test.

Table-1. Socio-economic status and family inventories of respondents

Parameters	Hanumangarh (50)	Churu (42)	Jhunjhunu (30)	Jalore (40)
Category				
Other Backward Class (OBC) (%)	62	43	66	0
General (%)	36	43	20	80
Literacy (%)	86	43	80	45
Age (years)	45.04±1.54	49.52±2.07	44.26±2.27	50.1±1.40
Family Size	7.48±0.47	8.66±0.57	6.2±0.39	8.8±0.48
Land Holding (bigha)	51.52±4.86	33.58±7.55	29.62±6.37	62.13±11.94
Landless (%)	2	43	13	25
Horse strength/owner	3.46±0.45	1.95±0.29	6.13±3.65	3.00±0.58
Owner having other livestock (%)	98	76	100	95

Table-2. The quantity of feed and fodder offered to horses in Rajasthan

Parameters	Hanumangarh (50)	Churu (42)	Jhunjhunu (30)	Jalore (40)
Dry fodder offered (kg)	4.820 ±0.22	8.143±0.348	5.267±0.69	6.100±0.196
Green fodder (kg)	16.38±0.58	-	5.20±1.10	7.33±0.55
Concentrate (kg)	2.810±0.138	2.452±0.145	2.933±0.160	1.950±0.200
Wedding charges/ booking	-	1100-2100	1100-3100	1100-2100

Results and Discussion

Rajasthan is scattered over a large area and divided in nine agro-climatic zones [4]. The desert state faces both the temperature extremes (winter and summer). The district (Churu and Jhunjhunu) is mostly rain fed (Transitional Plain of Inland Drainage), Hanumangarh is canal-irrigated (Irrigated North-Western Plains) whereas Jalore is tube-well irrigated (Transitional Plain of Luni Basin). Agricultural farming and animal husbandry is the major source of income of the people of Rajasthan. Socio-economic status and family inventories of respondents are depicted in table 1. Majority of respondents engaged in horse rearing were of other backward class (OBC) & general category. Only a few people of minorities and scheduled castes were involved in this enterprise. Literacy (%) among the horse owners was more in Hanumangarh (86%) and Jhunjhunu (80%) districts, whereas it was low in Churu (43%) and Jalore (45%) districts. Family size of respondents was significantly ($P<0.05$) different among the districts studied. Family size was highest in Jalore and lowest in Jhunjhunu and it was affected by literacy level of the owner. Table-1 indicated that people of middle age group took keen interest in owning horse. Age of respondents was non-significantly different among the districts studied.

Majority of the respondents engaged in horse rearing owned agricultural land. However, among the respondents landless (%) was highest in Churu district and lowest in Hanumangarh district indicating farming as a major source of their livelihood, followed by horse and other livestock husbandry. Land holding was significantly ($P<0.05$) different among the districts and it was highest in Jalore and lowest in Jhunjhunu. Land holding was higher in the districts where water was available for irrigation indicting farmers were taking keen interest in agriculture.

Majority of the respondents were maintaining other livestock along with the horses. Mean herd size of horses ranged between 1.95 to 6.13 in different districts studied. Mean horse strength of Jhunujhunu was significantly higher than other areas studied because one respondent was maintaining 55 horses for safari & breeding, otherwise the pattern of horse owning was not different among various districts studied. Majority of the farmers of Hanumangarh, Jhunjhunu and Jalore were maintaining Marwari horses only while in Churu non-descript horses were more prevalent. Majority of the respondents were also maintaining cattle, buffalo and goats along with the horses. The interests of respondents in rearing other livestock in Hanumangarh, Jhunjhunu and Jalore may be due to sufficient feed and fodder resources as well as irrigation facilities. Pattern of maintaining other livestock was similar in Hanumangarh, Jhunjhunu and Jalore. In Churu, only 76% of respondents were maintaining other livestock that may be due to scarcity of feed and fodder in the area. Majority of the respondents of Churu, Jhunjhunu and Jalore were using the mares for ceremonial purpose and earning between Rs 1100-3100 per ceremony whereas horse owners of Hanumangarh were maintaining horses mainly for breeding and riding purpose.

Feeding Management: The quantity of feed and fodder offered to horses in four districts of Rajasthan are depicted in Table-2. In Hanumangarh district, horse owners were offering lucerne (*Medicago sativa)*, oats (*Avena sativa*), berseem (*Trifolium alexandrinum*), jowar (*Sorghum bicolor*) and dub (*Cynodon dactylon*) grass as green fodder; groundnut (*Arachis hypogaea*) straw, moth (*Vigna aconitifolia*) straw, wheat (*Triticum aestivum*) straw and jowar karbi as dry roughage; barley (*Hordeum vulgare*), gram (*Macrotyloma uniflorum*), oats and wheat bran as concentrate to their horses. Majority of them were offering *ad libitum* green fodder and dry roughages. The total concentrate was fed in two equal instalments during morning and evening hours. The respondents were supplying mineral mixture (46%), locally made *masala* (46%) and mineral mixture+masala (8%) regularly to their horses. The composition of traditional herbal mineral combination adopted in north-western Rajasthan has been reported [5]. Majority of the respondents were offering feed additives in the form of ghee and or milk

to their horses especially during winter. Out of these 42% were supplying ghee and milk both where as 28% were supplying ghee only.

In Churu district, horse owners were supplying green fodder seasonally not regularly; groundnut straw, moth straw and bajra karbi as dry roughage, barley, gram, bajra (*Pearl millets*) and moth *dal* as concentrate to the horses. The total concentrate was fed in two equal instalments during morning and evening hours. The respondents were supplying mineral mixture (15%), locally made *masala* (19%) and sendha and common salt (33%) regularly to their horses. Only 48% respondents were offering feed additives (ghee and or milk) to the horses during winter only.

In Jhunjhunu district, horse owners were offering lucerne, oats, dub and jowar grass as green fodder, moth straw, wheat straw, bajra karbi and dry grasses as dry roughage, barley, gram, bajra and moth dal as concentrate to the horses. The total concentrate was fed in two equal instalments during morning and evening hours. The respondents were supplying mineral mixture (47%), locally made masala (6%) regularly to the horses. Majority of the respondents (67%) were offering feed additives (ghee or milk) to the horses during winter & pregnancy.

In Jalore district, horse owners were providing lucerne, mansa grass and dub grass as green fodder, bajra and jowar karbi (un-chaffed) as dry roughage, and bajra as concentrate to the horses. The total concentrate was fed to the horses in the morning only. Majority of the respondents were not supplying mineral mixture, but common salt was being offered occasionally to their horses. One respondent was occasionally supplying *Citrullus colocynthis* (L.) Schr. (tumba) to each horse as an appetizer and dewormer. Majority of the respondents were not offering any feed additive, only 10% were supplying mustard oil during winter season.

The average green fodder offered to the horses was highest in Hanumangarh and lowest in Jhunjhunu district but in Churu it was provided during rainy season only. Green fodder feeding to the horses was significantly ($P<0.05$) different among the districts. Horses of Hanumangarh area were being provided highest quantity of green fodder due to ample availability in the region; whereas in Churu they were being offered least quantity and that too seasonally only might be due to least availability of green fodder due to scarcity of irrigation facilities in the region. Dry fodder feeding to the horses was significantly ($P<0.05$) different among the districts and it was highest in Churu and lowest in Hanumangarh district. The possible reason of low supply of roughages in Hanumangarh might be highest supply of green fodder and the animal was fulfilling the dry matter requirements from the green fodder, whereas in Churu region the green fodder supply was negligible and all the dry matter requirements of the horse were met through the dry roughages and concentrate only. Concentrate feeding was significantly ($P<0.05$) different among the districts. Concentrates were offered in largest quantity in Jhunjhunu, where as lowest in Jalore. Concentrate feeding to the horse was more in Jhunjhunu and Hanumangarh districts may be due to the awareness among the owners about the nutritional requirements of the horse as the literacy % among these districts was high. It was observed during the survey that horse owners were providing green fodder, dry roughages and concentrate depending up on the availability/ production of these items in that region. Hence, fodder (green & dry) and ingredients of the concentrate were observed area specific. It was also recorded that chaffed green fodder and dry roughages were offered to the horses in all the three area except Jalore where un-chaffed fodder/roughages were being offered. Possibilities of wastes of un-chaffed fodder are more. Hence, it must be avoided. It is well established that farmers of Hanumangarh and Jhunjhunu are comparatively prosperous than the farmers of other two areas and the same could be seen in pattern of feeding of horses, as high quantity of concentrate, feed additives (milk & ghee) and mineral mixture were offered in Hanumangarh and Jhunjhunu regions. Literacy among the horse owners of Hanumangarh and Jhunjhunu was also higher that could be another reason of adoption of feed, fodder and other practices.

Average body weight of a Marwari mare is around 350 Kg. While considering moisture 90% in green fodder and 10% in concentrates and dry roughage. The dry matter intake (DMI) in mares at Hanumangarh district was 2.44% of body weight consisting 0.72% concentrate, 1.24% dry roughage, and 1.64% green fodder. The DMI in mares at Churu district was 2.83% of body weight consisting 0.63% concentrate, 2.08% dry roughage, and 0.12% green fodder. The DMI in mares at Jhunjhunu district was 2.25% of body weight consisting 0.0.75% concentrate, 1.35% dry roughage, and 0.15% green fodder. The DMI in mares at Jalore district was 2.26% of body weight consisting 0.5% concentrate, 1.5% dry roughage, and 0.20% green fodder.

The total DMI in Marwari horses in Rajasthan is ranging from 2.25% to 2.83%. DMI in Marwari horses in field conditions was similar to the National Research Council (NRC) recommendation of 2 to 2.5% of their body weight in dry matter [6]. However, in Churu district DMI was 2.83% of body weight, it may be due to comparatively high intake of dry roughage due to less availability of nutritive green fodder and concentrate. Surveyed equines were apparently healthy and no major health problems related to nutritional deficiency was noticed so it may be concluded that current nutritional practices in these areas is providing the required protein, energy and minerals sufficiently.

Housing Management: Housing management adopted in four districts of Rajasthan is depicted in Table-3. Majority of the respondents were providing *kutchcha*

Table-3. Housing management of horse in four districts of Rajasthan

Stable Parameters	Hanumangarh (50)	Churu (42)	Jhunjhunu (30)	Jalore (40)
Floor				
Kutchcha (%)	80	86	100	95
Pucca (%)	20	14	0	5
Wall				
Kutchcha (%)	0	24	0	30
Pucca (%)	86	57	73	35
Pillars (%)	14	19	27	35
Roof				
Pucca (%)	90	5	0	10
Thatch (%)	10	62	40	60
Tin (%)	0	33	20	30
Asbestos (%)	0	0	40	0
Manger				
Pucca (%)	96	38	73	70
Wooden (%)	4	62	27	30
Water trough				
Pucca (%)	68	14	33	25
Bucket (%)	32	86	67	75
Manure pit				
Adjacent (%)	12	24	13	35
Distant (%)	88	76	87	65
Use of Disinfectants (%)	12	0	0	0

floor to the horses. Horse is very sensitive animal; benefits of rearing of horses on *kutchcha* floor are well established. *Pucca* floor is a major cause of laminitis in horses. Majority of respondents of the area surveyed have erected roof of stables either on *pucca* walls or pillars. Roof of stables was *pucca* in Hanumangarh area where as in other areas studied the availability of thatch roof was more common. However, some of the farmers provided tin and asbestos roof to their horses which is comparatively un-comfortable during harsh environmental conditions. It was reported that 44% of mule producers of Haryana, Uttrakhand and UP provide *kutchcha* thatch shed to their equines [7]. Majority of horses were provided with *pucca* manger in the area studied except Churu district where wooden mangers were common. The wooden manger could be shifted from one place to another depending upon the need and they are easy to clean. Majority of respondents were offering water to the horse in buckets in most of the areas studied except Hanumangarh where *pucca* water troughs were provided for watering that was common for all the livestock they were maintaining. Location of manure pit was at distant place in majority of the cases studied. The respondents were using horse dung for compost preparation by mixing it with the dung of other livestock. No other utility of dung was reported by the respondents. In veterinary practices use of disinfectants is recommended as these play significant role in controlling infection and leads to good health. Respondents (12%) of Hanumangarh only were using disinfectants in the stables indicating the least awareness among the horse owners about the importance of disinfectants.

Breeding and health management: Table-4 depicts the breeding and health management practice adopted in four districts of Rajasthan. There was paucity of quality stallions throughout the area surveyed. Only 15-20% respondents of Hanumangarh, Jhunjhunu and Jalore were rearing stallions for covering whereas in Churu no respondent was maintaining stallion. They were fully dependent on the outside stallions for breeding their mares that comes from other areas i.e Haryana, Punjab during breeding season of mares. The respondents had to pay between Rs. 1100/- to 5100/- as covering fee with no guarantee of conception. Stallion generally moves in 15-20 KM radius for covering of mares for 2-3 days. The mares available in heat period were being covered without keeping attention of day of heat. Due to the over use of stallion, conception rate was reported very low. All the three areas where stallions were available the mares were not covered before day 3rd of estrus. But in Churu, 10% horse owners were getting mares covered even on second day of heat. The mares remain in estrus for a long period and ovulation takes place before the end of estrus [8]. Hence, mares should be got covered keeping in view the stage of estrus not as per the availability of stallions. During the survey it was observed that most of the owners get their mares covered on two consecutive days i.e. 3rd and 4th or 4th and 5th which may not be scientifically correct as stallion spermatozoa remain viable for 36-48 hours in mare's reproductive tract [9]. Hence, mares must be covered on alternate days from day 4th onwards till the mare remains in estrus. Age at first covering was reported as 31 months by most of the respondents which is before the mare becomes adult indicating that equine owners breed their mares before the optimum breeding age. Most of the respondents were getting their mares covered 2-4 coverings per cycle. Most of mares were rebred during foal heat only. Majority of the respondents were not aware about the symptoms of estrus mare. Majority of respondents were regularly grooming their horses and also caring hooves of their horses regularly. Practice of hair clipping was not reported by the respondents but they were clipping the hairs of mane only. Shoeing was common in stallions and the mares being used for ceremonial purpose.

Table-4. Breeding and health management practices for horses in four districts of Rajasthan

Stable Parameters	Hanumangarh (50)	Churu (42)	Jhunjhunu (30)	Jalore (40)
Age at first covering (months)	30.96±0.79	31.57±1.0	32.73±1.01	31.50±0.88
Day of covering				
2-3 day	0	10	0	0
3-4 day	54	62	13	55
4-5 day	46	28	67	45
5-6 day	0	0	20	0
No. of covering per cycle	2.36±0.07	2.24±0.10	2.13±0.09	2.30±0.11
Covering charges (Rs)	3432±349	1681±114	2127±129	2855±231
Deworming practice (%)	92	67	87	70
Grooming (%)	84	76	87	85
Hoof care (%)	62	86	80	40
Use of dung (%)	86	52	60	48

At present the equine breeding services in the form of superior Marwari stallions and artificial insemination (AI) facilities at the field level are not available. Although, the technique of stallion semen freezing for laboratory and farmers' door has been standardized [10-13] but extension efforts need to be strengthened as to make equine owners aware about the merits of use of AI in mares and Animal Husbandry Department of State Government should also take initiative for AI in equines by getting their veterinarians trained through National Research Centre on Equines (NRCE). The technique could be utilized for providing the superior quality frozen semen to the owners and it will also help in conserving the true to breed stallions of any breed and the frozen semen could be used for AI.

Colostrum provides passive immunity against various diseases during neonatal period [14]. Most of the equine owners feed the colostrums to the foal within one hour of foaling. Average age of foal at weaning was 5 months (range 4-6 months) and it was observed a bit early in the foals whose owners were using mares for ceremonials purposes. There is need to vaccinate the equines as prophylactic measures. But, none of the equine owners responded that they have got their equids vaccinated regularly, while they were vaccinating tetanus toxoid to the horses on the recommendation of veterinarian. Although majority of the respondents were aware of prophylactic vaccinations but not get their equines vaccinated due to one or another constraints. It was also noted that deworming of horses was being done by locally made masalas or using therapeutic medicines. Most of the respondents were deworming horses as curative measures in most of the regions studied, whereas deworming of horses was a common practice among the equine owners of Jhunjhunu and Hanumangarh. Deworming of horses was being done as curative measures in Spiti valley [15], whereas deworming of equines was a common practice among the equine owners of Haryana, Uttar Pradesh and Uttarakhand [6]. Importance of equine health is well understood by the equine owners, but the facilities they avail are mainly curative rather than preventive. The sick equines are taken to veterinary hospital for treatment. They were well satisfied with the services of veterinary hospitals. In similar type of study, it was reported that horse owners of Spiti valley were well satisfied with the services of veterinary hospital and the free supply of veterinary medicines they received for their horses [15]. Insurance of livestock including horses is must to protect the horse owners against livestock losses. But, none of the respondent responded that they were adopting insurance of their horses due to one or another reason. Similar observations were also reported in equines from other states including Haryana, Uttar Pradesh, Uttrakhand and Himachal Pradesh [6,15].

Conclusion

Horses were being maintained for ceremonial purposes and breeding, their feeding in terms of fodder (green & dry) and concentrate were observed area specific and were fulfilling the minimum nutrient requirements. There was paucity of true to breed stallions in the areas studied.

Authors' contribution

All authors contributed equally. All authors read and approved the final manuscript.

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Competing interests

Authors declare that they have no competing interest.

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