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Study on reproductive performance of Nellore Jodipi sheep in RKVY and non-RKVY flocks under field conditions

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Abstract
A study was conducted to evaluate the reproductive performance of Nellore Jodipi sheep, native sheep breed of Andhra Pradesh in RKVY and Non-RKVY flocks of farmers in Andhra Pradesh. The data on reproductive traits *viz.*, age at first mating, age at first lambing, service period, lambing interval were acquired from the sheep farmers via structured questionnaire. Twenty-eight farmers were interviewed in order to obtain information on sheep breeding operations and reproductive performance in their flocks. The overall least squares mean for age at first mating in rams, age at first mating in ewes, age at first lambing, service period and lambing interval were 584.17 ± 4.92, 643.34 ± 6.11, 837.95 ± 4.70, 162.78 ± 1.54 and 408.93 ± 7.67 days, respectively.

Keywords: Sheep, Nellore Jodipi, farmers, lambing, mating, service period

Introduction
India has rich sheep biodiversity with 44 registered sheep breeds with the total population of 74.26 million accounting for 13.83 per cent of the total livestock population of India. Sheep population of Andhra Pradesh is about 17.6 million coming around 23.73 per cent of the total sheep population of the country, ranking second in the country (20th Livestock Census, 2019) [1]. Nellore, India's tallest mutton purpose sheep breed, is predominantly distributed in Nellore, Prakasam and Chittoor districts of Andhra Pradesh.

The Rashtriya Krishi Vikas Yojana (RKVY) programme was established to advance agriculture and related sectors, among other government policies and programmes that the Government of India has put into place to increase farmers' income. From 2009 to 2010, the RKVY project is being carried out at the Livestock Research Station (LRS), Palamaner by Sri Venkateswara Veterinary University of Andhra Pradesh, one of the nodal organisations. This project provided superior Nellore Ram germplasm to the needy farmers in order to improve the genetic makeup of their flocks, which in turn improved the socioeconomic status of rural poor people. Reproductive traits in Nellore Jodipi sheep were studied as reproduction is an important factor in determining productivity of the ewes. Evaluating the reproductive parameters will help in knowing the reproductive performance of flock under field settings, one of the most significant economic attributes of sheep which in turn will aid in understanding the issues pertaining to changed reproductive performance. Therefore, the goal of the current inquest is to ascertain how the RKVY Program has impacted the Nellore Jodipi Sheep's reproductive performance in the farmer's flocks under field conditions.

Materials and Methods
The current study on Nellore Jodipi sheep was carried out in Chittoor district of Andhra Pradesh to assess the reproductive performance of sheep in RKVY and Non-RKVY flocks. The flocks that received rams from Livestock Research Station (LRS), Palamaner were named as RKVY flocks and others as non-RKVY flocks.

Data on reproductive performance and their management practices were collected through observation and interaction with the flock owners and shepherds using structured questionnaires from eight villages in the Yerpedu and Srikalahasti mandals.

Based on information acquired from the farmers/owners of the animals via structured questionnaires, the following reproductive parameters were assessed. Age at first mating is the time interval between the date of birth and first mating of the animal was taken as age at first mating which was expressed in days. Age at first lambing is the period between the birth of the animal and the first lambing was taken as age at first lambing and is expressed in days. Service period is the number of days elapsed from lambing till the subsequent fertile conception is termed as service period. Lambing interval (days) is the time interval between first and second lambing. The data collected were subjected to standard statistical procedures as per Snedecor and Cochran (1994) [2].

Results and Discussion

Twenty-eight farmers were interviewed in order to obtain information on sheep breeding operations and reproductive performance in their flocks. The results pertaining to reproductive traits under study are presented in Table 1. There was no significant difference in any of the reproductive traits studied, between RKVY and non-RKVY flocks.

Age at first mating in males

The overall least squares mean for Age at first mating in rams was 584.17 ± 4.92 days and the respective ages in RKVY and non-RKVY flocks were 578.25 ± 5.12 and 590.10 ± 6.02 days. The flocks had no significant influence on age at first mating in males and the males matured at an early age in RKVY flocks when compared to non-RKVY flocks.

The age at first mating in males obtained in the present study corroborated with the findings of Dass *et al*. (2004) [3] in Marwari, Rajanna *et al*. (2012) [4] in Nellore, Harini *et al*. (2019) [5] in Nellore Palla sheep. Lower values have been reported by Jagatheesan *et al*. (2004) [6], Karunanithi *et al*. (2005) [7], Chandran *et al*. (2009) [8] and Gangaraju *et al*. (2010) [9] in Mecheri, Mecheri, Vembur and Vizianagaram sheep, respectively. However, higher value for these traits has been reported by Dey and Poonia (2005) [10] in Nali and Chander (2012) [11] in Magra sheep breeds.

Age at first mating in females

The overall least squares mean for age at first mating in females was 643.34 ± 6.11 days. The mean age at first mating among the flocks varied from 606.23 ± 7.71 days in RKVY flocks to 680.45 ± 6.84 days in non-RKVY flocks. The ewes in RKVY flocks matured at an early age compared to flocks of non-RKVY which might be due to the fact that the ewes gained mature body weights earlier due to the effect of superior germplasm. However, differences were insignificant.

These findings were in concurrence with Gohil (2010) [12] in Marwari, Chander (2012) [13] in Magra, Rajanna *et al*. (2012) [4] in Nellore and Rani *et al*. (2016) [14] in Nellore Jodipi sheep. However, the Nellore Jodipi sheep in this study have better age at maturity than other breeds reported by Dey and Poonia (2005) [10] in Nali sheep, who, reported higher mean values for age at first mating (AFM) in females. The means in the present study were higher than the values reported in Vembur (Chandran *et al*., 2009) [8], Vizianagaram (Gangaraju. 2010) [9] and Nellore palla (Harini *et al*., 2019) [5].

Age at first lambing

The mean age at first lambing in ewes was 837.95 ± 4.70 days and the means ranged from 825.25 ± 5.24 to 850.65 ± 6.75 days in RKVY and Non-RKVY flocks, respectively. The present value for age at first lambing was found close to the findings of Shipra (2003) [15] in non-descript indigenous sheep of Bhanjanagar area of Orissa and Rani *et al*. (2016) [14] in Nellore Jodipi sheep. Reddy (1980) [16] reported higher values for age at first lambing in Nellore sheep. The present values were higher than those reported by Bemji *et al*. (2001) [17], Gbangboche *et al*. (2004) [18], Akthar *et al*. (2007) [19], Nayak *et al*. (2010) [20], Rajanna *et al*. (2012) [4], Kumar *et al*. (2018) [21] and Harini *et al*. (2019) [5] in Yankasa, Djallonke, Hissardale, Ganjam, Nellore, Harnali and Nellore Palla sheep breeds, respectively.

Service period

The overall least squares mean for service period was 162.78 ± 1.54 days with the means varying from 150.24 ± 3.12 (RKVY) to 175.33 ± 5.65 days (non-RKVY). The means recorded in the present study were within the range of means reported by Singh and Koli (1996) [22] in Bharat Merino sheep. The obtained means were lower, when compared with the reports of Gohil (2010) [12] in Marwari and Jahan *et al*. (2013) [23] in Balochi sheep. The overall means for service period in present study were higher than those reported by Dixit *et al*. (2002) [24] in Bharat Merino, Shipra (2003) [15] in non-descript indigenous sheep of Bhanjanagar area of Orissa, Pan *et al*. (2004) [25] in Garole, Patro *et al*. (2006) [26] in Kendrapada, Tailor *et al*. (2007) [27] in Sonadi, Siddhalingamurthy *et al*. (2017) [28] in Mandya sheep.

Lambing interval

The overall least squares mean for lambing interval was 408.93 ± 7.67 with a range of means from 395.23 ± 10.48 to 422.63 ± 9.23 among RKVY and non-RKVY flocks. The means noticed in the present study were well coincided with the previous findings of Purushotham (1978) [29] in Nellore and Mandya sheep, Gupta (2000) [30] in Australian Merino, Jain *et al*. (2005) [31] in Bellary, Lalit *et al*. (2016) [32] in Harnali and Rani *et al*. (2016) [14] in Nellore Jodipi sheep. Nimbkar (1993) [33] in Deccani and Gupta (2000) [30] in Merino and Rambouillet sheep observed higher values of lambing interval than the present findings. However, the means in the present study were higher than the values reported in Ganjam and Bolangir sheep (Mohanty, 1991) [34], Garole (Bose *et al*., 2000) [35], Yankasa sheep (Bemji *et al*., 2001) [17], non-descript indigenous sheep of Bhanjanagar area of Orissa (Shipra, 2003) [15], Garole sheep (Pan *et al*., 2004) [25], Malpura (Kumar *et al*., 2008) [36], Ganjam (Nayak *et al*., 2010) [20] and Mandya sheep (Siddhalingamurthy *et al*., 2017) [28].

Table 1: Least squares means of Reproductive traits (days) in Nellore (jodipi) sheep

	AFM (M)			AFM (F)			AFL			SP			LI		
	n	**Mean**	**S. E**	**n**	**Mean**	**S. E**	**n**	**Mean**	**S. E**	**n**	**Mean**	**S. E**	**n**	**Mean**	**S. E**
Overall	135	584.17	4.92	538	643.34	6.11	538	837.95	4.70	538	162.78	1.54	538	408.93	7.67
Flocks	**NS**			**NS**			**NS**			**NS**			**NS**		
RKVY	63	578.25	5.12	292	606.23	7.71	292	825.25	5.24	292	150.24	3.12	292	395.23	10.48
Non-RKVY	72	590.10	6.02	246	680.45	6.84	246	850.65	6.75	246	175.33	5.65	246	422.63	9.23

n = number of animals, S. E=Standard error, F= Female, M= Male, NS=Non-significant

AFM=Age at first mating, AFL=Age at first lambing, SP= Service period, LI= Lambing interval

Most of the reproductive traits recorded in the present study corroborated with the previous findings of Rani *et al.* (2016) [14] in Nellore Jodipi sheep and Harini *et al.* (2019) [5] in Nellore Palla sheep. There was no significant difference in any of the reproductive traits studied, between RKVY and non-RKVY flocks, which can be attributed to the fact that there were no prescribed breeding practices being followed in the farmers flocks under field conditions and the rams are left in the flocks along with ewes for mating throughout day and night.

Conclusion

Reproductive traits in Nellore Jodipi sheep were studied as reproduction is an important factor in determining productivity of the ewes. The ewes maturing at an early age and lambing at a regular interval helps not only in quick build-up of the flock through increased rate of replacement but also enhance the rate of genetic progress by way of reduction in generation interval along with increased income source to rural poor sheep farmers. Breedable rams may be supplied to farmers in accordance with state sheep breeding policy in order to boost ewe productivity. The adoption of a breeding policy will safeguard the indigenous sheep germplasm, ensuring the survival and improvement of the Nellore Jodipi sheep breed.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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