

ADAPTABILITY OF RUSSIAN ANGORA RABBITS IN SEMI ARID TROPICS

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ABSTRACT : Russian Angora rabbits raised under semi arid conditions during 1982-1985 had average kindling % of 58.7. The average litter size at birth and at weaning (6 weeks) were 5.68 and 3.62 respectively. Body weight at birth 6, 12 and 24 weeks were 55 g, 536 g, 1.17 kg and 2.61 kg and 54 g, 536 g, 1.19 kg and 2.64 kg. The first group of data corresponds to males and the second to females. The wool was clipped firstly at 3 months of age and then at quarterly intervals. The wool yield showed steady increase with the age and was highest in the fourth clip : 40g/clip at 3 months

and 60g/clip for adults on average. The wool yield in young as well as in adult rabbits was lowest in June clip (-36%/general mean). The influence of age, years and season of clip were significant ($P \leq 0.01$) while the sex difference were non significant. The breeding of Russian Angora rabbits was discontinued after 1985 due to appearance of a genetic disorder "Retarded Wool Syndrome" which cause significant loss in wool yield. It was probably due to inbreeding in a small population coupled with adverse effect of hot climate.

RESUME : Adaptabilité du lapin Angora Russe au climat tropical semi aride.

Les lapins Angora Russe élevés sous climat semi aride de 1982 à 1985 ont un taux de mise bas de 58.7%. La taille moyenne de la portée à la naissance est de 5.68 et de 3.62 au sevrage. Les poids à la naissance, 6, 12 et 24 semaines sont de 55g, 536g, 1.17kg, et 2.61kg pour les mâles, et de 54g, 536g, 1.19kg et 2.64kg pour les femelles. Le poil a été tondu la première fois à 3 mois puis ensuite tous les trimestres. La quantité de poil s'accroît régulièrement avec l'âge avec un maximum à la quatrième tonte : 40g/tonte à 3

mois et 60g chez l'adulte en moyenne. La production de poil la plus basse, aussi bien chez les jeunes que chez les adultes, se situe à la tonte de Juin (-36%/moyenne générale). L'influence de l'âge, de l'année et de la saison de tonte sont significatifs ($P \leq 0.01$) tandis que la différence entre sexe ne l'est pas. L'élevage des lapins Angora Russe a été irrégulière après 1985 en raison de l'apparition d'un problème génétique "Retarded Wool Syndrome" qui occasionna d'importantes chutes de production de poil. Ceci était probablement dû à des accouplements dans une trop petite population ajoutée aux effets contraire du climat chaud.

INTRODUCTION

Angora rabbits yield is one of the finest animal fibre (10 to 15 micron diameter) and is used for making quality apparels. The world wide production of Angora rabbits wool was estimated to be around 8000-9000 tones in 1986 (ROCHAMBEAU and THÉBAULT, 1990). The Angora wool production in India has been reported to be about 20 tons from Russian Angora rabbits and their crosses with German Angora in Himachal Pradesh. Small rabbit units having Russian and German Angora rabbits are found in Jammu and Kashmir and Uttar Pradesh hills but the information of total wool production has not been documented.

Average wool yield of Russian Angora rabbits in erstwhile USSR was reported to range between 300-500 g (KOETTER, 1963). In India, the average wool yield of Russian Angora has been reported to be 260 g in temperate climate of Himachal Pradesh by SINGH and NEGI (1986). Semi arid tropical conditions with high ambient temperature (27 to 46°C) and low moisture index (-20 to -40) cover more than 50 % of total geographical area in India (GUPTA, 1986a),

however, no data on performance of Angora rabbits is available from this region. A small unit of Angora rabbits was established at Avikanagar in semi arid desert of Rajasthan in 1982 to study their adaptability under these agro-climatic conditions so that they can be propagated in larger area.

In this paper, the results of preliminary trials on adaptability and performance of Russian Angora rabbits under semi arid tropical conditions have been presented.

MATERIALS AND METHODS

Russian Angora rabbits were brought in India by importation from USSR in 1978-79 at the Division of Fur Animal Breeding, at Garsa, under the temperate climate in Himachal Pradesh. In 1982, 3 males and 10 does of Russian Angora rabbits were shifted to the Central Sheep and Wool Research Institute, Avikanagar, to study their adaptability and performance under semi arid conditions. Under these conditions the maximum ambient temperature ranged between 34 to 46°C with

Table 1 : Reproductive performance of Angora rabbits

Trait	Mean \pm S.E.
Kindling percentage	58.70 \pm 3.46 (99)
Litter size at birth	5.68 \pm 0.31 (59)
Litter size at weaning	3.62 \pm 0.41 (37)
Litter weight at birth (g)	251.8 \pm 9.4 (59)
Litter weight at weaning (kg)	1.91 \pm 0.01 (37)

The figures in the parenthesis indicate the number of observations.

relative humidity of 15–35 % in summers (Marsh to June). In July to September months, the environmental heat is lowered (32 to 38°C) but the humidity is increased to 65–85 %. The animals were protected from excessive hot winds in summer by putting soaked wind screens made of thorny bushes on windows of rabbit house. During October to February months, the maximum ambient temperature ranged between 15 to 32°C with average relative humidity of 65 %.

The adult animals were kept in individual cages made on galvanized iron wire mesh and arranged in single tire. The thatched house with excellent ventilation was used. The kindling of does was obtained in specially designed cages with nest boxes. The young rabbits were weaned at 6 weeks of age and ten housed in colony cages till 3 months of age. Animals were maintained on standard rabbit pelleted feed (5 mm pellets having 21 % CP). Wilted cow pea and Lucerne green folder were given in autumn and winters respectively whereas in summer, the hay made from these forages containing about 85 % dry matter were fed ad libitum. Fresh drinking water was available to rabbits round the clock.

The data recorded on these rabbits during 1983 to 1985 on reproduction, growth and wool yield have been included in the present study. The wool yield data on 560 clip records was analyzed using LSMLMW-PC-Version 2 Computer programme of HARVEY (1990) to see the effect of sex, season and age.

RESULTS

The average kindling percentage in does was found to be 58.7. It varied from 50 to 64.5 % during different months. The reproductive performance of Angora rabbits in different years has been given in Table 1. The average birth weights of rabbit young were 54.6 and 54.3g in male and female respectively.

Table 2 : Growth performance of Angora rabbits.

Trait	Male	Female
Average birth weight (g)	54.6 \pm 1.5 (151)	54.3 \pm 1.6 (155)
6 week body weight (g)	536 \pm 22 (76)	531 \pm 22 (72)
12 week body weight (kg)	1.17 \pm 0.04 (71)	1.19 \pm 0.02 (65)
24 week body weight (kg)	2.61 \pm 0.09 (61)	2.64 \pm 0.07 (65)

Figures in the parenthesis indicate the number of observations.

The body weights at weaning, 12 and 24 weeks of age in male and female rabbits have been presented in Table 2. The sex differences in growth traits were non significant.

The wool was sheared four times a year at quarterly intervals in March, June, September and December months. The first clip was obtained at 3 months of age. The least square means of wool yield in different clips at different age have been presented in Table 3. The average wool yield per clip in male and female animals of different age groups were not significantly different. The wool yield in weaners was lower than that of adults and the differences were highly significant ($P \leq 0.01$). The wool yield of weaners as well as adult rabbits was lowest in June clip and the seasonal variation was significant. ($P \leq 0.01$).

DISCUSSION

In India, more than 50 % geographical area comes under semi arid tropical region where high ambient temperature (Maximum temperature range of 27 to 46°C) persists with low moisture index (-20 to -40) in air (GUPTA, 1986a). In semi arid desert of Rajasthan where the present experiments were conducted, extreme heat waves are the major problem confronting the rabbit production in summers (March to June). The average kindling percentage in Russian Angora does was 58.7 which vary greatly in different months. The fertility of rabbits in summer was poor. MATHUR *et al.* (1984) reported that under semi arid tropical conditions the semen quality in terms of semen volume, sperm concentration, sperm motility and gel volume was affected adversely in summers. The seasonal variation in fertility of Angora rabbits has been reported by FIRSOVA (1974) and RICK MUNOZ (1984).

The litter size at birth in Angora rabbits has been reported to be due to higher embryonic mortality (BROCKHAUSEN *et al.*, 1979). In this study, the average litter size at birth was low (5.68). Although the

Table 3 : Factors affecting wool yield in Russian Angora rabbits

Independent variable	No	Least square mean (g)	S.E of least square means	Mean sum of squares
Population mean	567	50.09	1.01	
Sex				120
Male	291	50.55	1.28	
Female	276	49.63	1.33	
Ages				37243**
Weaners (3 months)	127	40.18	1.79	
Adults (≥ 6 months)	440	60.01	0.93	
Clip				31323**
March clip	143	56.60	1.73	
June clip	175	32.76	1.52	
September clip	127	43.99	1.84	
December clip	122	67.02	1.95	
Remainder variance	561			385

ovulation rate was not measured but higher embryonic loss due to the effect of small population size and heat stress can not be ruled out. Similar data on litter size at birth in German and French angora rabbits have been reported by GARCIA *et al.* (1984) and THÉBAULT et ROCHAMBEAU (1988). The litter size at weaning ranged between 4.12 (1983) to 3.35 (1985). The smaller number of young weaned per doe was due to higher mortality in the first week of age. This was probably due to poor fostering ability of does under heat stress. Similar results on litter size at weaning in Angora rabbits of different breeds have been reported by GARCIA *et al.* (1984) THÉBAULT et ROCHAMBEAU (1988) and SINGH *et al.* (1989). ROUGEOT and THÉBAULT (1984) held that the fostering capacity of an angora doe appeared limited. The litter weights at birth and litter weight at weaning were low due to smaller litter size and poor mothering ability of does under these agro-climatic conditions.

The average birth weight of young was normal however, the weaning weights were low in both male and females. The pre weaning growth of young rabbits depends entirely on mother's milk yield. PAPP *et al.* (1983) reported that milk yield of rabbit doe was maximum at 15°C ambient temperature and a reduction of 7.7g was observed with 1°C rise in environmental temperature. Probably the higher ambient temperature caused the reduction in milk yield of does which affected the pre weaning growth adversely. The post weaning growth (12 and 24 week weight) was also slow. GUPTA *et al.* (1992) reported that under semi arid conditions, young rabbits of meat breeds born in spring had poor post weaning growth than that born in autumn and winter season. This was probably due to poor intake of feed by the young rabbits after weaning due

to summer stress. GUPTA (1986a) reported that rabbits adapted to semi arid conditions by reducing their body weights, thus minimizing the heat load.

The first clip yield at 3 months of age was lowest and showed improvement until 4th clip at one year of age. The effect of age on average wool yield was highly significant ($P \leq 0.01$). The observations of RICK MUNOZ (1984) and MONTAYA ONATA (1985) corroborated these results and reported that highest wool yield was obtained in third harvest. The average wool yields in quarterly clip in male and female animals in weaner as well as adults groups were not significantly different. The winter clip (December) yields were highest and the June clip harvest was lowest in all groups. The seasonal variation was highly significant ($P \leq 0.01$). Seasonal variation in wool yield of angora rabbits have also been reported by KOETTER (1963), MAGOFKE *et al.* (1982), ROUGEOT and THÉBAULT (1983) and CARO *et al.* (1984). ROCHAMBEAU *et al.* (1991) reported that summer clip was lowest in angora rabbits.

After spring clip in 1985, the appearance of wool loss on different parts of body of majority of rabbits was noticed. GUPTA (1986b) suggested that the patchy wool regrowth was due to the expression of Retarded Wool Syndrome. Similar observations have also been reported by CHEEKE *et al.* (1978). ROUGEOT and THÉBAULT (1989) reported that in French angora, the hair follicles are on rest and are not stimulated until the autumn moult which generally begin on August. In the present study the affected areas in Angora rabbits showed no regrowth of wool subsequently. Wool fibres in angora rabbits are due the expression of a I allele which has been reported to be recessive to normal fur

gene L. In this study, it was presumed that the pleiotropic effect of some other genes antagonistic to angora genes located at same or different chromosomes might have been exposed due to inbreeding in small population. Since the beginning of breeding of rabbits, careful grouping of animals in three sire groups was done to avoid the inbreeding. The average inbreeding coefficient was 0.1875 in the progenies showing the disorder. The pleiotropic effect of rex gene with angora gene have been reported by MAGOFKE *et al.* (1982). Further the possibility of genotype environment interaction under the hot environmental conditions could not be ruled out. The rabbits once showed the disorder were never recovered in subsequent clippings and the affected stock had to be culled. From these preliminary findings it has been concluded that under semi arid conditions, the raising of angora rabbits for wool production may not be economical, however longer studies on larger population can give more conclusive evidences.

Acknowledgement : Authors thank the Director, Central Sheep and Wool Research Institute, Avikanagar, for providing the facilities.

Received : March 1994

Accepted : July 1995

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