

## Performance, development and use of Romanov in France

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**Abstract.** The Romanov (R) breed was imported to France in 1963. In 1987, there were 15 000 purebred and 80 000 F1 ewes. The ewes have a high precocity and good adaptability to breeding season changes. Litter size (LS) is about 2.2 at 18 months and over 3 in adults, resulting from a high ovulation rate (OR) and a reduced embryonic mortality (EM). OR is less variable, but LS as variable as in other breeds. There are 0.8—1.9 % freemartins.

In ewe lambs, the heritabilities of OR, EM and LS are 0.39, 0.09 and 0.02, resp. R has a favourable direct effect on lamb viability. Heterosis is high on fertility in ewe lambs, but less on OR and LS, favourable on lamb viability. The lack of performance regression from F1 to F4 in crosses with Berrichon du Cher has allowed the creation of a composite line (INRA 401), used on farms. Ewes suckle a maximum of twins. Lambs grow fast but have a low carcass and meat quality.

A good viability of crossbred lambs and a good productivity of F1 ewes have been observed both in intensive and extensive conditions. In extensive system, R ewes are relatively susceptible to gastro-intestinal parasitism but are resistant to hepatic or pulmonary parasitism. R lambs seem to be susceptible to caseous lymphadenitis.

Favourable results have been obtained with regard to prolificacy of F1 or 1/4 R ewes and viability of lambs in six other European countries, but an unfavourable effect of heavy summer heat on male activity and female fertility. Composite lines have been created in Spain and Hungary.

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Index words: Romanov, precocity, litter size, ovulation rate, embryonic mortality, lamb viability, Berrichon du Cher, heterosis, composite line

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### I — Situation in France

Romanov (R) breed was introduced to France in 1963 (43). In 1987, there were 15 000 purebred ewes among which 4 000 registered to UPRA (Unité de Promotion de Race) in 54 flocks, raised in different breeding systems.

These different systems are: 1) permanently outdoors, principally mated in autumn (Sept. to Dec.); 2) outdoors and indoors, principally mated in autumn with about 20 % of matings out of this period; 3) principal matings early in the season (Aug. to Oct.) and second mating in autumn (Nov. to Jan.); 4) ac-

celerated lambing rhythm with 3 or 4 lambing periods per year.

## II — Reproduction

### 1) Fertility

R is characterized by early sexual maturity, long sexual season (16, 31, 61), good postpartum ovarian and sexual activity in April-May, with minimum silent ovulations (48), post partum interval of 36 days in season (58). Good performances are achieved in a system of 3 lambings in 2 years with synchronization of oestrus, with or without PMSG in season (14, 30).

### 2) Litter size and its component

Examples concerning flocks from different breeding systems (1981 to 1986) are given in table 1. The average litter size (LS) is maximum in system 1 (3.11) and at minimum in system 4 (2.55). In all these systems, LS varies from 1 to 5 (less than 2 % have LS of 6).

LS is the result of a high ovulation rate (OR) and a reduced embryonic mortality (EM), (45, 46; table 2 and 3). OR is less variable in R ewes than in Finn ewes (CV = 20 to 24 % vs 33 to 37 %) but LS is as variable as in the other breeds (CV = 30 to 34 %) (2).

The high OR of R ewes results from a more numerous population of recruitable follicles, together with a normal selection through atresia during the late follicular phase. On the contrary the high OR of the Finn ewes results from a markedly reduced incidence of selection through atresia (18, 19).

The mechanisms controlling OR are already present at 3—5 months of age (17).

### 3) Genetic parameters of LS and its components (550 R ewes) (45):

	OR	% EM	LS
Repeatability (inter-year)	0.30	0.07	0.12
Heritability (h <sup>2</sup> )	0.39	0.09	0.02

### 4) Frequency of freemartinism: (34, 35)

2 to 3 % of infertile ewe-lambs

0,8 to 1,9 % of freemartin (some are fertile) in 125 females of mixed litters.

### 5) Number of ovarian follicles at birth and at 4 weeks old

The difference between R and Ile de France (IdF) was significant at birth but not at 4 weeks. At birth, the number of growing follicles is 58 in R (7 % of antral follicles) compared to 337 (26 % of antral follicles) in IdF lambs. At 4 weeks of age, atresia of antral follicles has appeared only in IdF and not in R lambs. Retardation of follicular development together with retardation in the establishment of ovarian sensitivity to gonadotrophins are typical features of R lambs ovaries during the post-natal period (54).

### 6) Gonadotrophin plasma levels

*In young males* the mean levels of LH and FSH are at maximum between 6 and 8 weeks.

*In ewe-lambs*, pituitary FSH concentration at birth is higher in R than in Berrichon du Cher (BC) or crossbreds (36). The level of FSH was maximum at 3 weeks, and at a much higher level than in Lacaune, and significantly higher than in males (44, 28, 29). The prepuberal plasma level of FSH is highly heritable, but not correlated with OR at the two first matings (2).

### 7) Testis growth and male fertility

Testis diameter of R lambs are not higher than in crossbred lambs, when compared at the same age (50 to 100 days), although the latter have much heavier body weight (42).

Daily production of semen in rams of 18 months of age was lower in R than in IdF. This difference between the two breeds corresponds to a lower total number of Sertoli cells in the R at 3 months of age (26, 27). However, the daily production of semen of the

Table 1. Litter size of Romanov ewes in 4 systems of reproduction: Distribution of LS and influence of age at lambing.

LS	Mating periods				
	Sept. to Dec. (100 %) only outdoors	Sept. to Dec. (80 %) in and outdoors	Aug. to Oct. (50 %) Nov. to Jan. (50 %) in and outdoors	June-July; Aug.-Sept.; Jan-Feb.; Mar.-May indoors	
1	5.5 %	9.0 %	5.8 %	9.7 %	
2	20.4	30.5	29.0	40.3	
3	38.4	41.9	46.7	37.1	
4	28.9	16.0	17.4	11.5	
5	6.3	2.6	1.0	1.5	
6	0.4				
n	3813	1815	1970	4280	
LS	3.11	2.73	2.79	2.55	
CV %	32.0	33.9	29.9	34.2	
Ewe age	1 year (n)	2.24 (254)	2.13 (346)	2.16 (236)	2.28 (609)
	2 years (n)	2.83 (1641)	2.65 (461)	2.66 (352)	2.36 (1029)
	adult (n)	3.24 (9662)	2.97 (1006)	2.93 (1382)	2.68 (2642)
ADG	10-30 days	173	176	177	173
	30-70 days	185	225	189	200

n = No. of lambings. ADG = Average daily gain of lambs in g.

Table 2. Distribution of ovulation rate in Romanov and Finn ewes (41).

OR	Romanov				Finn	
1	0.7	0.6	0.8		1.0	1.9
2	34.7	7.1	12.6	1.4	32.5	13.3
3	55.0	60.5	56.5	16.9	39.3	36.1
4	8.8	28.2	27.6	45.1	19.0	26.9
5	0.5	3.6	2.0	28.2	6.4	13.6
6	0.2		0.4	8.4	1.4	4.1
7					0.3	1.6
8						1.6
9						0.9
$\bar{x}$	2.74	3.27	3.19	4.25	3.03	3.69
$\sigma$	0.66	0.67	0.72	0.88	1.00	1.38
CV %	24.1	20.5	22.4	20.8	32.9	37.4
n	556	496	246	71	295	316
age	10 mth	18 mth	10 and 18 mth	2 to 7 years	1.5 to 3.5 years	>4 years

Table 3. Litter size obtained at different levels of OR (embryonic mortality %) (From 41).

OR	2	3	4	5
Romanov	1.90 (5 %)	2.61 (13 %)	3.17 (21 %)	3.58 (28 %)
Finn	1.72 (14 %)	2.24 (25 %)	2.63 (34 %)	2.90 (42 %)
Other breeds	1.65 (17 %)	2.27 (24 %)	2.48 (38 %)	
	1.1 to 2.0	1.9 to 2.7	1.3 to 3.2	

R rams is less variable with the season. (15). Concerning the production of ejaculated spermatozoa, a favourable effect on the acceleration of the intensity of collection has been observed (13).

### III — Viability of lambs

*Mortality of R lambs* increases with increasing LS, but relatively less than in the other breeds. Also, in crossbreeding, R has favourable direct effect on the viability of the lambs. So for the same birth-type or birth weight, mortality of the lambs is at minimum in R and intermediate in the crosses (Fig. 1) (3, 44, 46, 49, 22, 39, 63, 12).

In the same flock, R lambs have a better viability in comparison with Finn lambs (10).

#### *Maternal behaviour during the first hours after parturition*

In primiparous ewes, disturbances in licking lambs or acceptance at suckling was less frequent in R (10%), than in Préalpes du Sud (35%), or IdF (50%). Aggressive behaviour was also less frequent in R ewes (38).

### IV — Milk production

R ewes have a lower milk production than BC or Lacaune ewes, but they suckle a maximum of twin or triplets, without reducing viability until weaning nor growth after weaning (10, 21, 23).

### V — Carcass quality

Compared to meat breeds, the carcasses of R lambs have a bad conformation, a lower proportion of bone, a higher proportion of internal fat, less  $\alpha$  fibres and a higher proportion of  $\beta$  fibres in the muscle (1, 6, 52, 59, 64).

Since 1978, a multibreed testing Station (Berrytest) was created to evaluate the within breed variability and to qualify breeding animals on growth rate and carcass quality (4). The breeding stock of the Berrytest Station

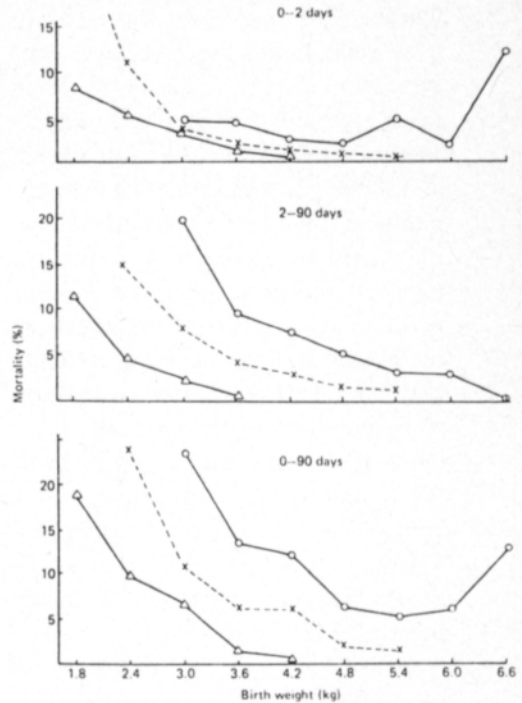


Fig. 1. Mortality of Berrichon du Cher (BC), Romanov (RO) and crossbred (F<sub>3</sub> to F<sub>4</sub>) lambs, according to their birth weight: singleton and twins in BC; singleton, twins and triplets in crossbreds; twins and triplets in RO ○—○ BC; △—△ RO; ×—× F<sub>4</sub> to F<sub>1</sub> (From 39).

consists of 200 R ewes and 750 crossbred R × IdF or R × BC ewes, managed according to a rhythm of 3 lambings in 2 years. In 1986, 496 sires from 9 French meat breeds have been progeny tested through 13825 progeny lambs (5, 6).

### VI — Resistance to parasitism, caseous lymphadenitis, cold exposure

1. — *Resistance of R ewes to gastro intestinal strongylosis*: the results don't show detectable relationship between hemoglobin type and resistance to haemonchus contortus (32).
- *Susceptibility to gastro intestinal nematodes*: on the Causse of Larzac, the R breed shows a higher natural susceptibility to gastrointestinal nematodes vs Lacaune breed (25).

— *Comparison between R, Merinos d'Arles (MA) and crossbreeds ewes.* The expression of parasitic level, based on faecal egg and larval counts, significantly increases from MA to crossbreed and R for gastrointestinal nematodes, moniezia spp., dictyocaulus filaria, and in contrast, decreases for fasciola hepatica and protostrongylus (mainly neostrongylus linearis). The mechanism of resistance involved seems different between the breeds for the two groups of helminth parasites. (11, 24).

— On irrigated grasslands (Camargue), the R and MA ewes suckling 1 or 2 lambs, have a similar grazing behaviour. However, the R ewes which are heavier, have less dry matter intake per Kg of live weight (60).

2. *Susceptibility to an experimental Corynebacterium Ps. inoculation.*

R lambs seem to have a greater susceptibility compared to Préalpes du Sud and IdF. They develop most and more severe typical abscesses (37).

3. *Concerning the resistance to cold exposure, in condition of transhumance, cf. VERMOREL et al. (62).*

## VII — Utilization of Romanov

*In pure bred:* According with flock size or economic situation, about 20 to 40 % of the ewes are mated with R pure rams to produce replacement. The remainder ones are devoted to industrial crossing.

*Crossbreeding* with R allows rapid upgrading of LS to the optimal level of 2.0, either by producing F1 ewes (80 000 in 1987), or establishing synthetic line, the INRA 401 (57).

1) Production of F1 ewes

Several experiments of crossbreeding between R and different local breeds have been realized in the INRA flocks and on farms. In all cases, we observe a good viability of crossbred lambs (F1 or born from F1 dams) compared with purebred lambs of local breeds, a favourable heterosis ef-

fect on ewe lambs fertility (78 % for the F1 R × Lacaune) (8) and a good adaptation of F1 ewes to extensive conditions.

*In accelerated rhythm of reproduction* (3 lambings in 2 years).

F1 R × Lim. : 2,66 weaned lambs/ewe/year	} 6200 ewes, 4 years, 2 flocks. MARZIN et al. (33)
Limousine : 1,93 .....	
F1 R × : 1,92 .....	
Mérinos d'Arles	
Merinos d'Arles : 1,24 .....	

*Litter size according to reproductive rhythm* (3 lambings in 2 years vs 1 lambing/year)

F1 R : 2,27 vs 2,46	} BRELURUT (9)
Limousine : 1,66 vs 1,87	
IdF : 1,61 vs 1,98	

*One lambing per year in very extensive conditions* (Causses du Larzac and Mediterranean area: 5400 ewes in 12 years): the F1 ewes (R × Lacaune and R × MA) have a superiority of 0.45 weaned lamb per year vs local breeds (8).

2) *The INRA 401* (43, 47, 51). This line is selected (in INRA experimental farm, near Bourges) in a specific reproductive system which consists of a first mating at 15 months out of season (April-May) and a second post-partum mating in October of the same year. The results are: fertility 0.86 and 0.82 respectively; LS 1.7 and 1.9; h<sup>2</sup> of fertility 0,06 and 0,03; of LS 0,13 and 0,08 (39, 56).

Since 1980, 450 males INRA 401 have been used on farms, to serve a population of about 21 000 ewes in 143 flocks (55).

*Insertion of the Booroola (F) gene in the R breed*

Since 1986, an experiment was undertaken, for the understanding of mechanisms underlying the regulation of OR. Observations on the F1 lambs concern FSH levels and OR (20, 17, 53), use of hCG between 3 to 5 months to distinguish lambs carrying or not Booroola gene.

## Conclusion

With 15 000 R ewes, 80 000 F1 ewes and 21 000 ewes issued from INRA 401 program, the total population of R and crossbreds represents about 115 000 ewes.

R breed has been also introduced in Spain, Portugal, Italy, Hungary, Czechoslovakia,

West Germany, and more recently in the Southern Mediterranean countries (Algeria, Tunisia, Egypt, Israël), South Africa and Canada

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