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EFFECT OF INDEPENDENT FACTORS ON SEMEN CHARACTERISTICS IN RABBITS

Gy. Virág* - M. Mézes** - A. Bersényi*

*Department of Rabbit Breeding, Research Institute of Animal Breeding and Nutrition
H-2100. Gödöllô
**Department of Nutrition, University Agricultural Sciences
H-2103. Gödöllô

Abstract

The authors investigated the connection between semen characteristics and the genotype as well as several different production and physiological traits.

It was found that there are differences between the traits which determine the semen characteristics of animals with different genotypes.

The quality of the semen is also affected by the weight gain and the glutathione-peroxidase activity of plasma, as well.

The density of the semen has a connection with body weight gain, with body weight at 12 weeks of age and also with glutathione-peroxidase activity of blood plasma.

The body weight gain, the glutathione-peroxidase activity of the plasma and the age of animals effect the motility of sperm cells.

None of the traits display connections with the percentage of abnormal cells, except the genotype.

Introduction

The using of artificial insemination in rabbit breeding has become increasingly common because of its many advantages. The successful adoption of artificial insemination as well as genetic requirements also demand the selection of bucks with high quality semen. Many investigations have been carried out in connection with the quality of semen in rabbit. These have been made under different circumstances and with different aims. Have been demonstrated the effect of both crossing and inbreeding on the traits which determine the quality of semen (1, 4). Some of the semen characteristics which were noted in different places and in different seasons varied for New Zealand white (4), chinchilla (1), bouscate (1) and angora (5) rabbits. It was also found that mating frequency (7) and body weight of the buck (1) had an effect on the quality of semen. The effect of season in various investigations was evaluated in different ways (4). The above mentioned problems demonstrate the need to pay more attention to all these factors especially those from investigations which were aimed at the comparison of different effects.

The goal of the present study was to study the effect of genotype, body weight gain between 6-12 weeks of age, body weight at 12 weeks of age and season as well as well as glutathione-peroxidase activity in the blood on semen characteristics.

The investigations were carried out between 4th May 1990 and 8th April 1991. in the rabbitry of the Research Institute of Animal Breeding at Gödöllô. The bucks were placed in individual breeder cages in the buildings of reproductive stocks. The rabbit buildings were heated during the winter season (minimum temperature was stabilised at +15°C and the ventillation was natural. The lighting regime was 16L/8D and artificial. The animals were fed rabbit pellets (Környe G-51 type). Five Californian and 15 New Zealand white rabbit bucks were investigated. The New Zealand whites were from three closed breeding lines - termed H,G,F - in similar proportions. The age, body weight gain between 6 and 12 weeks of age, body weight at 12 weeks of age (as known from the stock book) were different in the different groups of animals. There were not significant difference between average values of the above mentioned traits of the different genotypes. The semen samples were collected in each alternate week using an artificial vagina and heating doe. The semen sample collection was made in first part of the week. In the following two days the bucks were mated females normally. The semen samples were placed in a 37°C temperature water bath immediately and investigations into their motility were made as soon as possible after collection. The motility and density of the semen samples were estimated microscopically. Smears were made at the same time and later those were stained and estimated. Congo red and crystal violet were used for staining according to Cerovsky (2). One hundred sperm cells were counted on the slides and any abnormalities which appeared were registered. The morphological studies were performed using the method of Wekerle (8) assessing hog semen. The semen samples were stored at 5°C until the enzyme activity was measured. Blood samples were taken from the ear vein by venipuncture after collection of the semen sample and EDTA-Na was used as an anticoagulant. The seminal and blood plasma were separated by centrifuging (1600 g 15 min at +4°C). The measurement of the glutathione-peroxidase activity was carried out in the presence of reduced glutathione and cumene-hydroperoxide as substrates using end-point direct assay (Matkovics et al. 1988). The enzyme activity was expressed in units which reflect 1 nmol reduced glutathione oxidised per minute at 25°C. Activity was calculated in terms of protein content.

The effects of genotype and season were evaluated an analysis of variance. The connection between glutathione-peroxidase activity in the blood, age, body weight gain between 6 and 12 weeks of age, body weight at 12 weeks of age and semen characteristics were calculated using a linear regression analysis.

Results and discussion

The genotype produce significant differences between different stocks but also within one stock among varius lines as well in all investigated characteristics of the semen. The results are shown on Table 1. The body weight gain between the ages of 6 and 12 weeks has a slight positive correlation ($r=0.34$, $P<0.1$) with the volume of the semen and also has a slight negative correlation ($r=0.32$, $P<0.1$) with the motility of sperm cells and a slight negative correlation with the sperm density (fig.1.). The body

weight at 12 weeks of age displayed a slight negative correlation with the density of the semen.

The glutathione-peroxidase activity of the blood plasma has a slight correlation (r=0.35, P<0.1) with the volume of semen. The enzyme activity has a moderate positive correlation with the density of semen (r=0.42, P<0.06). The correlation with the motility of the sperm cells was moderate and negative (r=0.42, P<0.06), as shown on Fig.2.

The age of the animals has a slight negative correlation with the motility of the sperm cells (r=0.35, P<0.1) as shown on Fig. 3. The age has no effect on the other characteristics of the semen which were investigated.

The season only has a matematically evaluable effect on the density of the semen as shown in Table 2.

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Table 1.

The mean values of semen's traits at different genotypes

Trait	Genotype F	G	H	K
Quantity of semen (ml)	1.12	0.89	0.88	1.29
±s	0.25	0.15	0.22	0.35
Significance, P=0.01	g,k,h	f,k	f,k	h,g,f
Density of semen (valuated 1-5)	3.26	2.32	2.78	2.97
Significance, P=0.01	g,h,k	h,f,k	g,k,f	f,g
Motility of semen (valuated 10-100 %)	47.63	50.89	56.71	52.85
Significance, P=0.01	g,h,k	f,h,k	f,g,k	f,g,h
Percent of abnormal cells in semen	10.77	14.69	11.39	9.69
±s	3.89	12.74	5.24	3.18
Significance, P=0.01	g	f,h,k	g	g

Table 2.

The mean values of semen's traits in different seasons

Trait	Season Spring	Summer	Autumn	Winter
Quantity of semen (ml)	1.03	1.02	1.06	0.99
±s	0.47	0.44	0.43	0.37
Non significant				
Density of semen (valuated 1-5)	3.06	2.89	2.7	3.1
Significance, P=0.01	A	W	SP,W	S,A
Motility of semen (valuated 10-100 %)	53.55	50.35	52.75	54.45
Non significant				
Percent of abnormal cells in semen	11.87	9.68	11.77	11.46
Non significant				

Figure 1.

Effect of body weight gain on the motility of sperm

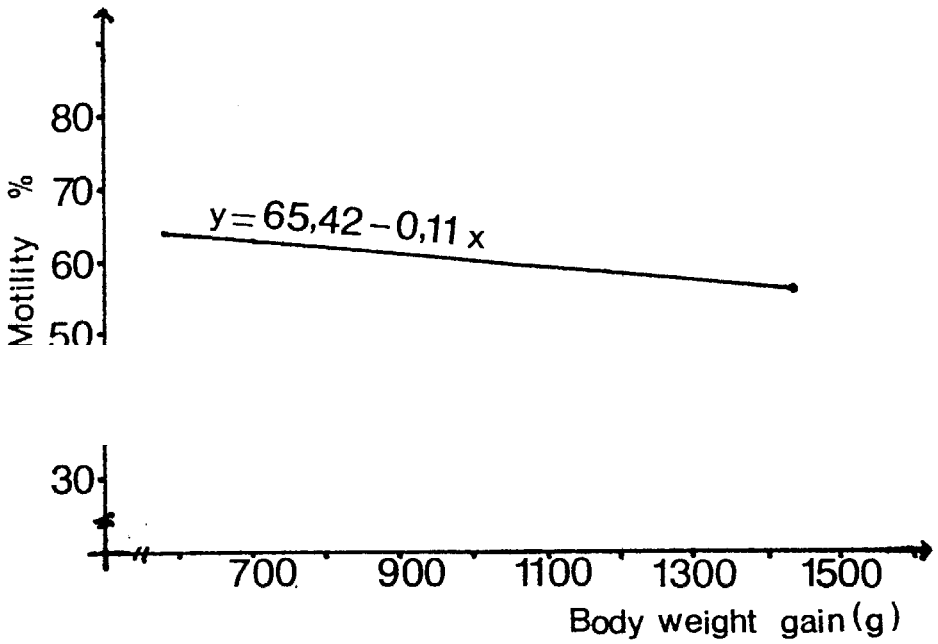

Figure 2.

Effect of GPH-Px activity of blood plasma on the motility of sperm

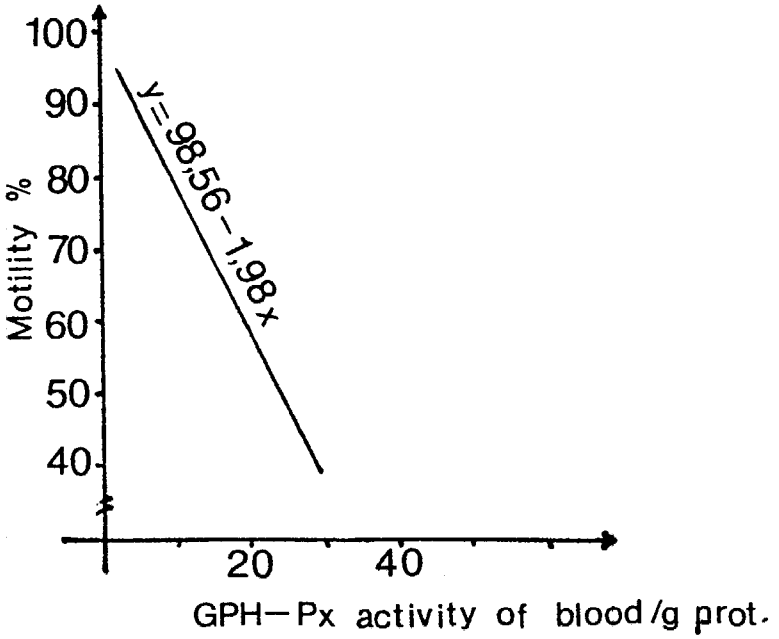

Figure 3.

Effect of age on mortility of sperm