10 Summary

The objective of this work was the examination of the influence of different photoperiods (natural lighting conditions versus two artificial light programmes) on the reproduction performance of female and male rabbits. The investigations were focussed on the observation of the rate of conception, litter size and litter weight at birth and at weaning. In addition the suckling behaviour of rabbit does was observed. The relationship between litter size, individual birth weight, development of live weight and the loss of pups from birth to slaughter were analysed with respect to different photoperiods. Within the slaughter at the age of 84 ± 2 days gonads were prepared for further investigations of the sexual development of the rabbits. In this context female rabbits were characterized by ovarian weight, uterine weight and follicular development. Analogically, male rabbits were characterized by testicular size and testicular weight in dependence on different photoperiods. Another point of view was the influence of different photoperiods on the sexual activity and semen quality of male rabbits.

These investigations were carried out with New Zealand White Crossbreds. The light regimes had different lengths of applied light. The natural light regime (NLR) was characterized by seasonal variation of daylength during the year. The artificial light regimes (ALR) were defined by constant lengths of photoperiods lasting 8 or 16 hours of light each day (8L:16D resp. 16L:8D) with a light intensity of 60 lux.

As a consequence of the results following conclusions could be drawn:

1. Reproduction performance of rabbit does

   - Under NLR a rate of conception of 65.7 % was obtained. Within the ALR a mean fertility of 67.6 % was observed. This value was about 1.9 % higher than the one from NLR. The highest rate of conception (69.3 %) was found within 8L:16D (16L:8D = 65.9 %).
   - The significantly highest number of total born pups was registered in 16L:8D (average 9.5 pups with a mean litter weight of 614 g).
   - The highest litter size of weaned rabbits was found in 16L:8D (8.2 pups with a mean litter weight of 5070 g).
• The pup index was introduced in order to summarize mean rate of conception and mean litter size. This index was defined as the number of alive born pups respectively weaned rabbits per 100 artificially inseminated does. The pup index facilitates the global assessment of the performance of a group of rabbit does.

• ALR showed to be more effective than NLR. Under ALR conditions a more of 55 alive born pups and 38 weaned rabbits per 100 inseminated does were obtained compared with NLR.

• The sequence of artificial insemination showed a significant influence on the rate of conception and the litter size. Nearly without exception high rates of conception and high litter sizes were followed by lower ones.

• The remating interval had a significant influence on the reproduction performance. A prolongation of the remating interval from 33 up to 66 days lead to a significantly higher reproduction performance.

• Primiparous does showed a significantly lower reproduction performance compared with multiparous does.

2. Suckling behaviour

• The mean frequency of suckling, analysed by infrared videotechnique, was 1.14 events in 24 hours in 16L:8D (1.41 times in 8L:16D) (p < 0.05). The mean duration of suckling and the total suckling period was significantly higher in 8L:16D compared with 16L:8D.

• If was found that the suckling activity was controlled by a circadian rhythm. The light - dark - change is a zeitgeber for nursing behaviour of does. The results provided evidence of a predominant nocturnality of suckling behaviour of the rabbits. Especially under 16L:8D 28.1 % of all sucklings occured in the first hour after switching off the light.

3. Development of live weight and pup losses

• Birth weight of the pups showed a significant difference between the investigated photoperiods. Pups under 8L:16D had the lowest birth weight (63.8 g) and pups under NLR showed the highest birth weight (67.9 g). It has to be noticed that differences in litter size were found between groups and that birth weight is significantly influenced by litter size.

• The weaning weight of the rabbits in NLR (620 g) was about 13 g higher than those in 8D:16L. The average weaning weight of the rabbits in 16L:8D amounted 613 g. It has to
be assessed that the individual weaning weight was significantly influenced by the birth weight and the litter size at weaning in the three groups.

• The survival rate in the suckling period was 91%. The survival of the young rabbits was significantly influenced by birth weight and litter size at birth.

• A total of 484 rabbits were slaughtered at the age of 84 ± 2 days. They showed an average live weight of 2988 g. There were no differences between the light regimes.

• The total rearing loss from weaning until slaughter amounted to 8.5% with no differences among the investigated groups.

4. Gonadal development at slaughter

• Male rabbits from 16L:8D showed the significantly lowest testicular size. Similar values for this parameter were observed in NLR and 8L:16D. A resembling relation was found for the testicular weight. Testicular size and testicular weight were significantly correlated with live weight of the rabbits.

• The ovarian weight showed no differences among the light regimes. Among the different photoperiods the lowest uterine weight were observed in 8L:16D. A follicular development (follicles with a size of > 1 mm, corpora lutea, follicles in regression) was only found in 39.7% of the females in 8L:16D. More than 50% of the female rabbits in NLR and 16L:8D showed a follicular development.

5. Sexual activity of male rabbits and semen quality

• In NLR the highest sexual activity of male rabbits was found. The increasing length of daylight in spring lead to an increased sexual activity of male rabbits. Analogically, decreasing length of daylight in autumn lead to a decrease in sexual activity. This corresponds with species-specific status in wild rabbit bucks. The sexual behaviour of bucks is activated in spring (increasing daylight) and deactivated in autumn (decreasing daylight) as reported in literature.

• Male rabbits in 8L:16D showed the significantly best results for nearly all investigated semen parameters.

• A significant correlation between live weight and testicular size was detected. With increasing body weight testicular size increased, too.

• A positive relation between testicular size and semen quality could only be determined for ejaculation volumina (r = 0.344).
Seasonal fluctuations could only be observed for the testicular size under the influence of the variation of daylength in NLR. Maximum testicular sizes were observed in March and April. After decreasing in the summer, the increase of testicular size started in October.