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EFFECT OF ENVIRONMENTAL TEMPERATURE AND RESTRICTED FEEDING ON PRODUCTION OF RABBIT DOES

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SUMMARY: 30 lactating NZW rabbit does were divided into 6 groups according to environmental temperature (5, 15, 23 and 30 °C) and to feed intake (*ad libitum* /A/ and restricted /R/). The does were kept at 20 °C during pregnancy and at kindling they were put into climatic chambers at a temp. of 5, 15, 23 or 30 °C. One part of the does were fed *ad lib.* (5A, 15A, 23A and 30 A) the others were all kept at 15 °C but they were fed the same (restricted) volume of pellet as the does' intake at 23° or 30° (15/23R and 15/30R). The litter size was adjusted uniformly to 7. The weight of does, milk production, feed and water intake were recorded daily.
Heat stress reduced daily milk yield (159, 161, 161 and 114 g), feed intake (289, 278, 261 and 185 g) and daily water intake (505, 521, 536 and 435 g) but increased the water/feed ratio (1.91, 2.02, 1.99 and 2.53) in the groups of does at 5°, 15° 23° and 30 °C respectively. On comparing the groups of rabbits kept at 23° and 30 °C fed *ad lib.* (23A and 30 A) and that of data obtained for 15/23R and 15/30R it was observed that the daily milk yield decreased by 7.8 and 5.1 %, daily water intake increased by 8.4 and 13.3 %, and the feed/water ratio was higher by 0.18 and 0.18 repectively.

Key words: rabbit does, temperature, restricted feeding, milk production, feed intake, water intake

RÉSUMÉ: 30 lapins de Nouvelle-Zéland en lactation out été divisés en 6 groupes la tempéreture de l'environnement (5, 15, 23 et 30 °C) et selon la nourriture consommée (ad libitum /A/ et alimentation limitée /B/). La tempéreature est gardées a 20 °C pendant la gestation et pendant la chaleur, apres les lapins sont mis dans des chambres climatisées a me température de 5, 15, 23 on 30 °C.
Le permier groupe est composé des lapins alimentés and libitum (5A, 15A, 23A et 30A), le deuxieme est composé de ceux qui sont gardés à 15 °C mais alimentés par la même quantité (limitée) de granulées que le troisiéme porté à 23° on à 30 °C (15/23R et 15/30R). La portée a été corrigée unifomément a 7.
Le poids, la production du lait, la consommation de l'eau et de la nourriture sont notés quotidiennement.
Le stress de chaleur diminue la performance quotidienne du lait (159, 161, 161 et 114 g), la consommation de la nourriture (289, 278, 261 et 185 g) et de l'eau (505, 521, 536 et 435 g), mais augmente le rapport eau/nourriture (1.91, 2.02, 1.99 et 2.53) respectivement dans les groupes de 5, 15, 23 et 30 °C.
En comparant les groupes de lapins portés a 23 et a 30 °C a l'alimentation ad libitum (23A et 30A) aux données obtenues du 15/23R et 15/30R, on peut observer que le performance quotidienne du lait a diminné de 7,8 et de 5,1 %, le consomamtion quotidienne de l'eau a augmenté de 8,4 et de 13,3 %, et le rapport eau/nourriture a été plus élevé de 0,18 et de 0,18 respectivement.

Mots clés: lapin, température, alimentation limitée, production de lait, consommation de l'eau et de la nourriture

Introduction.

The environmental temperature has influenced the performance of different animal species, so the performance of domestic rabbit too. The temperature has influence on some physiological parameters (Boiti *et al.,* 1992, Fayez *et al.,* 199) and directly or indirectly influences the food consumption and most of characters acting on the production (Prud'hon, 1976; Poujardieu and Matheron 1984; Stephan *et al.,* 1986)
Studies connected to the milk production of does have been published since and of '60. Results of these studies was summarized by Lebas (1975). Connection between environmental temperature and milk production are discussed by relative few studies. More data are connected to development of litter weight and prolification (Simplicio *et al.,* 1988, Fernandez *et al.,* 1995) but the shape of lactation curve was evaluated only by one team of outhors, Papp *et al.,* (1983), according to our best knowledge. In

those experiment the mortality of suckling rabbits was also increased due to high temperature, so the less litter size could also acts on the milk production.
In this experiment - beside the effect of temperature 5, 15, 23 and 30 °C on performance of does - we also tested the performance of two groups of does kept on 15 °C, but these does were fed with the same amount of feeds which was consumed by does kept on higher (23 and 30 °C) temperature.

Material and methods

The experiment was performed on does of New Zealand breed at the University of Vaterinarian Sciences. The does had earlier two parturition. In this experiment the pregnant does (n=36) were fed *ad libitum* at 20 °C temperature till their parturition, then six groups were formed, each group contained the same number of doe (n=6). The groups (treatments) were:

5A = does kept on 5°C, fed *ad libitum*
15A = does kept on 15°C, fed *ad libitum*
23A = does kept on 23°C, fed *ad libitum*
30A = does kept on 15°C, fed *ad libitum*
15/23 R = does kept on 15 °C and fed with daily amount of feeds consumed by does in group 23 A
15/30 R = does kept on 15 °C and fed with daily amount of feeds consumed by does in group 30 A.

The does were placed in climatic chamber. At parturition the litter size were equalized to seven, the died progenies were replaced with other sucklings earlier not involved in the experiment and had similar body weight to the died ones. The diet contained 11.4 MJ/kg DE and 14% crude protein. Water containers were freely attainable.
The daily milk production was established by difference in body weight measured before and affer suckling. The feed and water consumption were daily noticed. One-way analysis of variance and "t" test were applied for data procession and evaluation.

Results and discussion

Feed consumption of does

After parturition the feed intake was increared in each group (Fig. 1) but the consumption of group 30A decreased already after the second day of parturition. During the next week the consumption was a little above 150 g/day, then at the tenth day after kindling attained the permanent 180-200 g daily food consumption. (The group 15/30R of course could eat only similar amount of feed.) The feed intake in group 23A was on top at the tenth day after parturition, then gradually decreased and consumed 250 g/day food in the last week, similarly to group 15/23 R. The feed consumption in 5A and 15A was similar, the peak was attained at the sixteenth day, but from the tenth day the daily consumption was above 300 g till the day of weaning.
These results unanimously support the statments that high temperature decreases the feed consumption of rabbits (Prud'hon, 1976; Poujardieu and Matheron, 1984; Stephan *et al.*, 1986, Papp, 1994).

Water consumption of does

In water consumption of experimental groups there was not so big difference as in food consumption. Only the does in group 30A drunk always less water than does in the other groups. Water consumption of groups 15/30 R and 15/23 R was more than groups of 30A and 23/A, that means, the effect of temperature was stronger than the effect of feeding. Does on high temperature drunk more water/kg food than rabbits kept on lower temperature (Fig. 2).
Studies dealing with connection between water consumption and temperature are on inconsistent views: In experiment by Stephan (1986) the water consumption of rabbits kept on 30 °C was increased by 45% relative to rabbits kept on 18 °C, but in experiment by Prud'hon (1976) the consumption was decreased by 10%. The reason of this was probably the less drinking frequency.

Body weight of does

In days after parturition the body weight of does was a little bit higher than earlier, but in groups 5A and 15A did not change (Fig. 3). Rabbits in treatment 23A begun to lose body weight from the second week of lactation, but rabbits in group 30A had been losing weight during the whole experimental

period. Weight loss of rabbits in groups 15/23R and 15/30R was less than rabbits consumed the same amount of feed but at higher temperature.
In an earlier experiment (Papp *et al.,* 1983) body weight of does - kept on 10 °C and 15 °C - increased, at 23 °C remained unchanged but at 23 and 30 °C definitely decreased between the 6th and 29th days of lactation.

Milk production

Milk yield of groups 30A and 23/30R significantly was less than the production of does in other groups after the first two weeks of lactation. (Fig. 4). Due to the similarity of total milk production of the two (30A and 23/30 R) groups during the whole lactation, it can be stated, it was affected indirectly by the high temperature, though the decreasing food consumption. Decrease in milk yield in other groups is very small, only after the peak production can be seen a little bit faster decreasing in groups 32A and 15/23 R.
The high temperature in accordance of findings of other authors (Papp *et al.,* 1983; Simplicio *et al.,* 1988; Fernandez *et al.,* 1995) had a negative effect on the milk production, but among other groups we did not find so big differences as Papp *et al.,* (1983) and Papp (1955). The probably reason of it is that in this experiment the died suckling progenies were replaced so the effect of litter size did not prevail.

Litter weight

The litter weight was developed according to milk production of does (Fig. 5). From beginning of the 8^{th} day, and from beginning of the 10^{th} day the litter weight of groups 30A and 15/R was lagged behind the litter weight of other groups. Body weight gain of rabbits in group 15/23 R was decreased only during period when they begin to eat solid feed.

Feed consumption of suckling rabbits

The feed consumption of suckling rabbits in the experimental groups was similar, only rabbits in group 30A consumed less in time to time than the sucklings in other groups (Fig. 6). It seems, the effect of temperature on suckling rabbits is much less than on the mothers. This can be explained by that the optimal environmental temperature for suckling rabbits is much higher than the temperature for the adult does (Papp, 1955), therefore the negative effects of high temperature is less for the sucklings.

Water consumption of suckling rabbits

Rabbits in group 30A drank manifold more water than the other sucklings but water consumption of group 23 A was above average (Fig. 7). Groups 15/30 R and 15/R drank as much water than the other groups. These results show that the water consumption of sucklings depends much better on temperature than the water consumption of mothers and the influence of environmental temperature is directly prevailed.

Conclusions

On the base of results can be stated as follows
- The feed consumption of does during lactation is much better influenced by the environmental temperature than the water consumption.
- The change in body weight of lacting does is mainly influenced by the temperature. In case of equal feed consumption the does on high (30 °C) temperature lost more weight than does on optimal (15 °C) temperature.
- The milk production of does is influenced by the temperature through feed consumption (direct influence probable is not exists) because the milk production of groups 30A and 15/30R was equal.
- The feed consumptrion of sucklings is hardly influenced by the high temperature, because the 30 °C temperature means only a little more stress for them compared to their optimal environmental temperature.
- The water consumption of sucklings strongly depends on temperature. The consumption begins to rise already at temperature 23 °C and at 30 °C and already manifold water consumption was measured compared at 5 °C or at 15 °C. The temperature acts directly on water consumption, because it was independent from the feed consumption.

Figure 1. Feed consumption of does

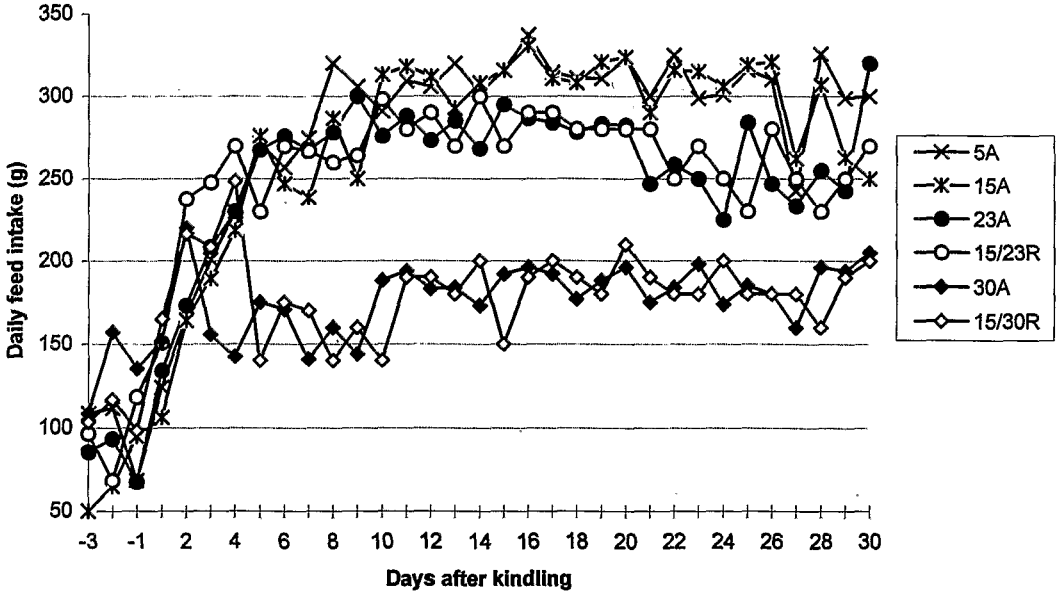


Figure 2. Water consumption of does

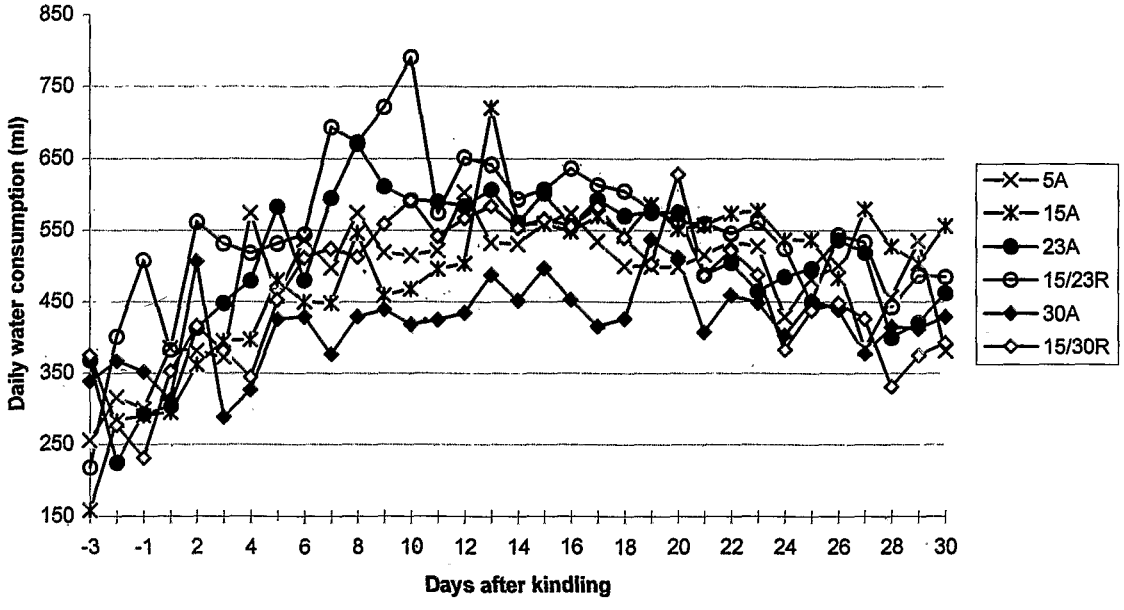


Figure 3. Body weight of does

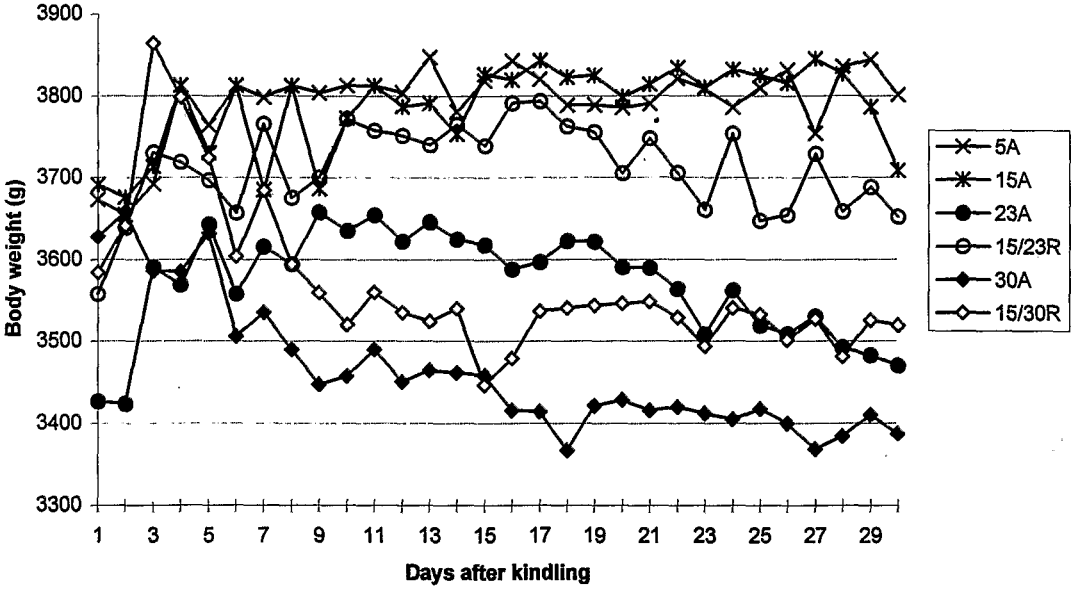


Figure 4. Milk production

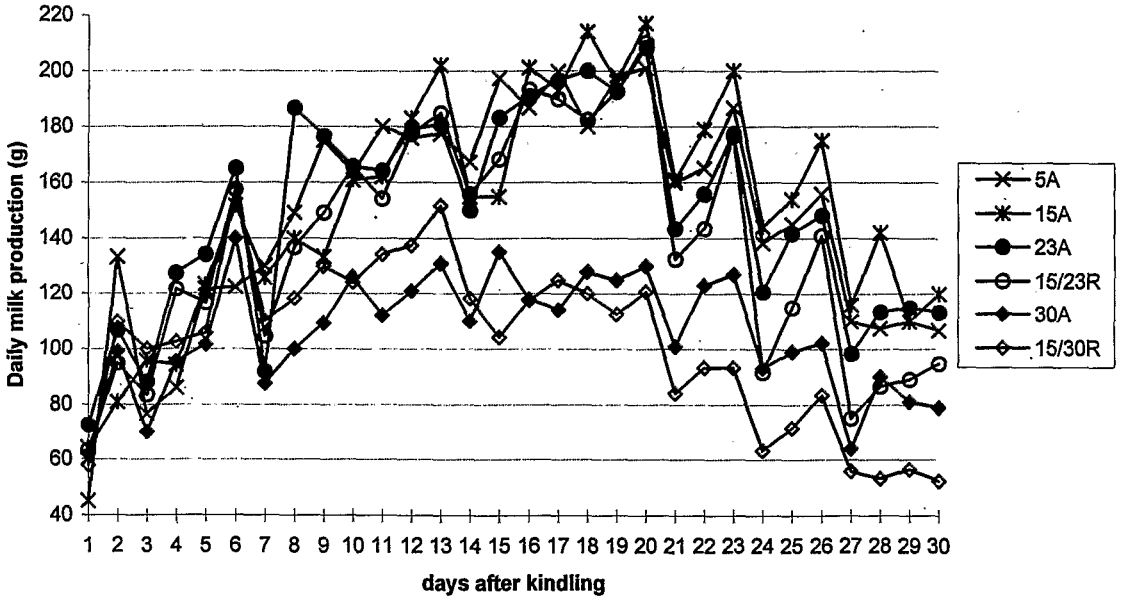


Figure 5. Litter weight

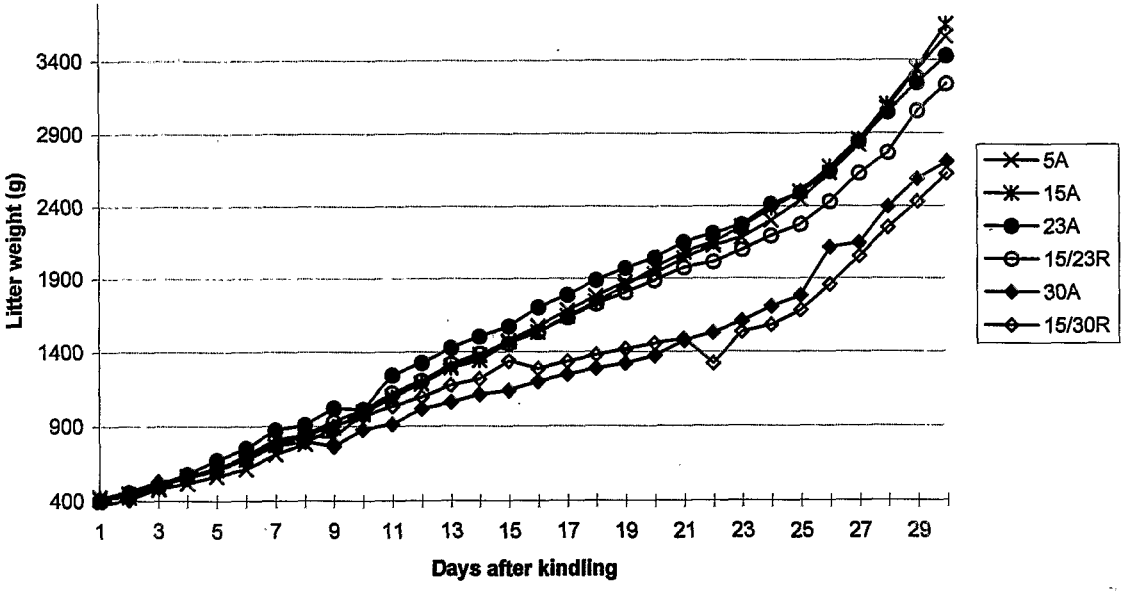


Figure 6. Feed consumption of suckling rabbits

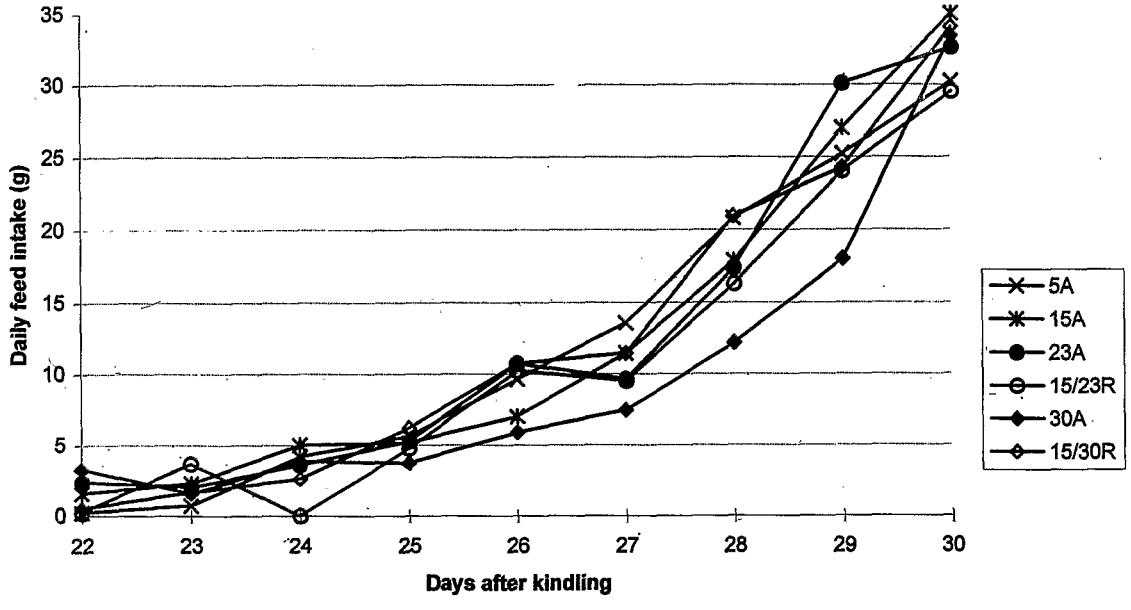
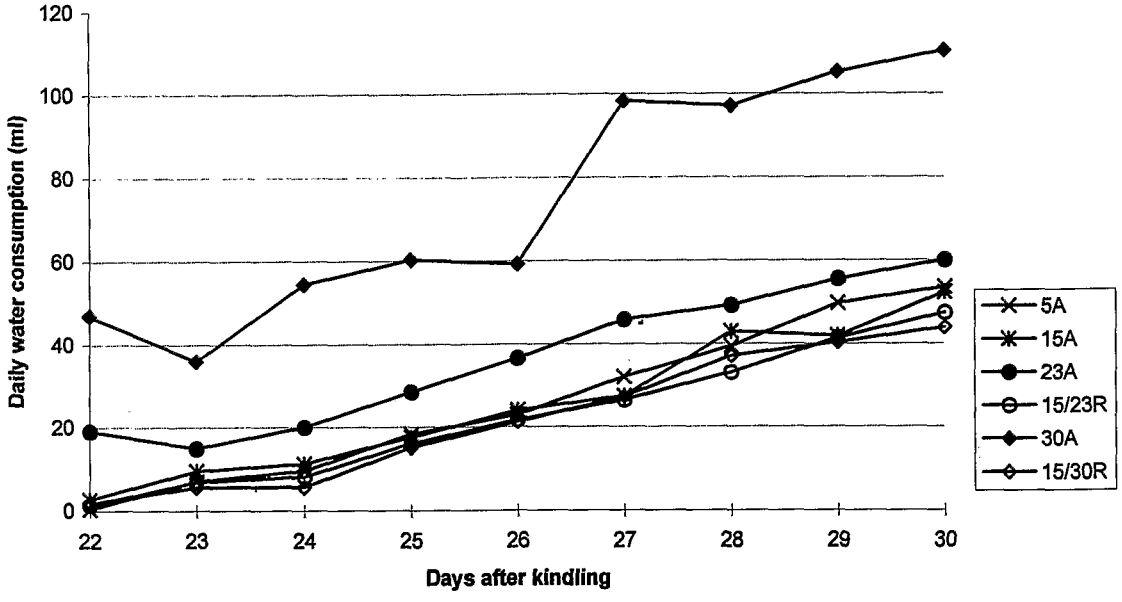


Figure 7. Water consumption of suckling rabbits



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