

REPRODUCTIVE PERFORMANCE OF RABBITS FED WHEAT BRAN WITH TROPICAL FORAGES OR *LEUCAENA LEUCOCEPHALA*

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ABSTRACT : Reproductive characteristics of 12 does fed 24 % (dry matter basis) fresh *Leucaena leucocephala* with wheat bran *ad libitum* were compared to 12 does fed wheat bran *ad libitum* with various herbaceous tropical forages *ad libitum* for 6 months. During the trial, 75 % of the *L. leucocephala* fed does either died or were eliminated due, indirectly, to pododermatitis. For these does, young born

were 83.6 % and young weaned were 55.7 % of the control group results. Offspring mortality was 52.2 % and total mass of young weaned was 2.4 kg compared to the control mortality of 28 % and weaned young mass of 5.2 kg. Results suggested that inclusion of *L. leucocephala* at 24 % of the diet in lieu of other forages *ad libitum* is detrimental to does and negatively effects reproduction.

RÉSUMÉ : Performances de reproduction de lapines nourries avec du son de blé et des fourrages tropicaux ou des feuilles de *Leucaena leucocephala*

Les performances de reproduction de 12 lapines recevant du son de blé *ad libitum* supplémenté à hauteur de 24 % de la ration par *L. Leucocephala*, ont été comparées à celles de 12 lapines recevant le son de blé *ad libitum* plus différents fourrages tropicaux *ad libitum*, pendant 6 mois. Durant l'expérimentation, 75 % des lapines recevant *L. leucocephala* soit moururent soit furent éliminées pour cause, au moins indirecte, de pododermatis. Dans ce groupe de lapines il y

eut 83.6 % de lapereaux nés et 55.7 % de lapereaux sevrés par rapport au groupe de référence ; la mortalité parmi les lapereaux fut de 52.2 % pour un poids total des lapereaux sevrés en 6 mois de 2.4 kg tandis que le groupe témoin enregistre une mortalité de 28 % pour un poids total au sevrage de 5.2 kg. Ces résultats suggèrent qu'une supplémentation avec *L. leucocephala* à 24 % en remplacement d'autres fourrages distribués *ad libitum* est préjudiciable pour les lapines et affecte négativement la reproduction.

INTRODUCTION

Although *Leucaena leucocephala* leaves have been reported as having high nitrogen contents and dry matter digestibilities of over 70 % (RAHARJO *et al.*, 1985) in rabbits, authors have warned of the negative effects of mimosine and its derivatives when fed to this species (MALINI *et al.*, 1989 ; TANGENDAJA *et al.*, 1990). MUIR and MASSAETE (1992), in a feeding trial with growing rabbits, suggested that length of exposure to mimosine in the diet, not simply quantity, may be a factor in the appearance of overt toxicity symptoms.

Negative effects on rabbit reproduction of this legume fed fresh *ad libitum* have been reported. TIKE *et al.* (1988) observed that conception continued but kindlings did not occur in does offered *L. leucocephala ad libitum* together with rice bran. The trial reported here was undertaken to determine whether fresh *leucaena*, fed at a fixed 24 % of the diet, affected reproductive performance of does and weaning weights of young fed wheat bran *ad libitum*.

MATERIALS AND METHODS

Two groups of 12 does of various ages and breeds were fed wheat bran (16 % crude protein) *ad libitum* for 6 months. The two groups were identical in age, breed (colour) and weight composition.

One group was given various fresh tropical forages *ad libitum*, including *Clitoria ternatea*, *Pennisetum purpureum*, *Macrotilium atropurpureum*, *Ipomea batatas* and *Neonotonia whittii*. The second group was supplemented with fresh *L. leucocephala* leaves at 24 % of the diet, dry matter basis. The *L. leucocephala* leaves had an average content of 24 % crude protein and 0.5 % mimosine (ILCA Laboratories). This value is within the range (0.76–1.78 ± 0.27) given for various *L. leucocephala* varieties by GUPTA *et al.* (1991) but below the range (1.61 % – 6.21 %) found by CHANDRASEKHARAN and GOVINDASWAMY (1985). The rabbits were fed their respective diets during a 4 week adaptation period prior to the first matings.

Table 1 : Mean weight changes and reproductive performance of rabbits fed *L. leucocephala* or herbaceous tropical forages

Diets	Does		Young born alive		Young weaned	
	Weight change	Nb of litters	Total	Per litter	Total	per litter
<i>L. leucocephala</i>	15.4 g	1.58	10.25	6.49	4.90	3.10
Forages	- 35.8 g	1.92	12.25	6.38	8.80	4.58
<i>P value</i>	0.74	0.10	0.15	0.74	0.001	0.19
<i>C.V (%)</i>	- 3557.4	26.3	28.0	30.4	33.6	49.2

The does were kept in wire cages (2.5 cm × 1.4 cm mesh opening with 1.5 mm wire diameter) in a cement rabbitry located in Southern Mozambique. The trial started in September, during the cool dry season (mean daily temperature 18.8°C) and ended in April, the end of the wet hot season (mean daily temperature 25.8°C and high relative humidity). An attempt was made to maintain a 3 month breeding cycle with young rabbits weaned at 6 weeks. Rebreeding took place after 14 days if the female proved empty.

Variables measured included weight change of does after 6 months, mortality of does, number of births, number of young per litter, number of young weaned, total number of young per doe during the trial period, weight of young weaned and total weight of young rabbits weaned during the experiment. Does were examined monthly for alopecia, haematuria, pododermatitis and general condition. Females with extreme cases of pododermatitis or extremely poor condition were eliminated and included in mortality figures but not included in the weight calculations. Does which died or were eliminated were subjected to post-mortem examination to determine causes of death or unthriftiness.

RESULTS AND DISCUSSION

Mean weight changes of the does were undifferentiated ($P = 0.74$) between treatments

(Table 1). The extremely high CV for this measurement may have been a direct reflection of the variable weight loss within the *L. leucocephala* treatment between does that suffered from pododermatitis and those that did not. In all, 75 % of the does had to be eliminated from this treatment, either during or shortly after the experiment, due to severe cases of these "sore hocks" (Table 2) which appeared in the last 2 months of the trial. Only 2 of 12 does exhibited mild alopecia. None of the does fed mixtures of other forages exhibited these symptoms. Pathological examinations at the Eduardo Mondlane University Laboratory did not reveal any systematic organ damage in dead or culled does, including haematuria.

L. leucocephala fed does had 22 % fewer kindlings and 20 % fewer young (Table 1) than the other females although young/litter were undifferentiated. The number of young weaned/litter was 48 % lower in the *L. leucocephala* fed cages. This last figure is mainly a consequence of the greater mortality among youngs (85 % higher in the *L. leucocephala* treatment, but also partly the consequence of the smaller number of litters in this treatment (Table 2).

Weight differentiation of young at weaning was not significant ($P = 0.34$). Likewise the total weight of young rabbits weaned/litter was also undifferentiated ($P = 0.19$) although there was a trend for greater weight/litter for the non *L. leucocephala* treatment (Table 2). Total weight of young weaned/doe in the herbaceous forages treatment, 5.2 kg, during the trial

Table 2 : Mean weight characteristics of young rabbits and litters at weaning resulting from cages with either *L. leucocephala* or mixture of herbaceous tropical forages on offer.

Diet	Individual young weight (g)	Average litter Weight (g)	Average does weight (g)	Young mortality	Does eliminated
<i>L. leucocephala</i>	493	1528	2416	52.2 %	75.0 %
Forages	596	2730	5245	28.2 %	0.0 %
<i>P value</i>	0.34	0.19	0.02	0.0001	0.0014
<i>C.V.(%)</i>	46.4	66.6	51.1		

period was more than double than that of *L. leucocephala* fed does, 2.4 kg. Although 22 % of weaned young rabbits exhibited some degree of alopecia in the *L. leucocephala* fed litters, none had pododermatitis either at weaning or at slaughter (2 kg live weight) after the trial (*L. leucocephala* administration was discontinued).

CONCLUSIONS

There was an obvious long-term negative effect of feeding controlled amounts of *L. leucocephala* to reproductive does. Number of young born was 83.6 % of the control group while young weaned were 55.78 %. This indicated that not reproduction but the ability to take care of young up to weaning was affected. *Leucaena leucocephala* in the young's diet may have been a factor in the low weaning weights but was less likely a factor in the mortality figures since it was consumed by these animals for only 2-3 weeks. Observation indicated that poor condition and low appetite of females with severe pododermatitis were more likely the reasons for higher mortality, especially of newborn young. Does with severe pododermatitis were constantly moving their hind legs as they sought more comfortable positions. A decrease in litter size and number of young weaned was particularly apparent in the last two months of the trial as "sore-hocks" became widespread and severe.

The results of this trial indicate that consumption of fresh *L. leucocephala* at a controlled 24 % of the diet may not affect reproduction as directly as when fed *ad libitum* (TIKE *et al.*, 1985, indicated a total cessation of kindlings with such a diet) but does have at least an indirect negative effect. Ability to care for its young up to weaning was obviously impaired, due to unthriftiness resulting indirectly from pododermatitis. Increased mortality in the does themselves also contributed to this decreased performance within the treatment, especially number of litters, towards the end of the trial period.

This experiment does not give conclusive evidence as to whether the cause of pododermatitis was alopecia on the hocks caused by mimosine toxicity or whether a nutrient deficiency such as Ca was involved. The *L. leucocephala*/bran diet had an estimated Ca percentage of 0.23 % (NATIONAL RESEARCH COUNCIL, 1977 ; CHEEKE, 1987), much lower than the 0.45-1.1 % estimated as minimum for does and litters by various authors (NRC, 1977 ; CHEEKE, 1991). The diet with a greater variety of tropical forages was likely higher in Ca content due to higher Ca percentages in *C. ternatea* (3.29 %), *M. atropurpureum*

(1.4 %) or *I. batatas* (1.79 % ; CHEEKE, 1987). Protein sources and percentages have also been found to affect reproduction in rabbits (AGANGA *et al.*, 1991). Further work therefore needs to be undertaken to determine whether smaller percentages of *L. leucocephala* should be present in the doe and litter diets without problems if non toxic nutritional factors are involved.

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BIBLIOGRAPHY

- AGANGA A.A., ADUKU A.O., ABDULMALIK M., SEKONI A., 1991. Effect of different protein sources and their levels on the reproduction of breeding rabbits. *J. Appl. Rabbit Res.*, **14**, 30-33.
- CHANDRASEKHARAN P., GOVINDASWAMY M., 1985. Occurrence of mimosine in the leaves of some species of *Leucaena* hybrid derivatives of *L. diversifolia* and *L. leucocephala*.
- CHEEKE P.R., 1987. Rabbit Feeding and Nutrition. *San Diego, Academic Press*.
- GUPTA B.K., AHUJA A.K., KHANJURA H.N., 1991. Fodder analysis of new *leucaena* varieties. *Leuc. Res. Rep.*, **12**, 40-41.
- MALINI B.P., GLORI DOSS R.G., MUNNE GOWDA M.K., GOVINDAIAH M.G., 1989. Preliminary studies of the effects of feeding *Leucaena leucocephala* to rabbits. *Leuc. Res. Rep.*, **10**, 31.
- MUIR J.P., MASSAETE E., 1992. Response of growing rabbits fed various levels of *Leucaena leucocephala* in a wheat bran based diet. *J. Appl. Rabbit Res.*, **15**, 1321-1328.
- NATIONAL RESEARCH COUNCIL, 1977. Nutrient Requirements of Rabbits. *Washington D.C., National Academy of Sciences*.
- RAHARJO Y.C., CHEEKE P.R., SUPRIYATIK, 1985. The nutritive value of *leucaena* leaf for rabbits. *Leuc. Res. Rep.*, **6**, 92-93.
- TANGENDJADJA B., RAHARJO Y.C., LOWRY J.B., 1990. *Leucaena* leaf meal in the diet of growing rabbits : evaluation and effect of a low mimosine treatment. *Anim. Feed Sci. Tech.*, **29**, 63-72.
- TIKE S., RAHARJO Y.C., FARRELL J., GULTON D., ARITOMAG D., 1985. Effect of long period of feeding fresh *leucaena* supplemented with fortified rice bran on the reproductive traits and on the growth of growing rabbits, 1984-4985. *Research Report, Res. Inst. Anim. Prod., Bogor*.