COMMON VETCH (*VICIA SATIVA*) FOR FEEDING DOES

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Abstract - Forty-eight New Zealand white does and 16 New Zealand White bucks (eight of them from Oregon, USA and eight born in Mexico) were used to evaluate if common vetch can be used for feeding does. The females were subjected to an intensive reproductive rhythm. Three treatments were evaluated: T_1, commercial diet, T_2 alfalfa meal diet 60% and T_3, common vetch diet 60%. Each diet was provided to 16 breeding does. Feed and water were offered *ad libitum* during the 224 day experimental period. The response variables evaluated were: litter size at birth, kits born alive at one day postkindling, litter weight at one day postkindling, number of kits weaned, litter weight at 28 days, parities and feed intake for first gestation only. No significant ($P>0.05$) differences among diets were found for the variables evaluated except for parities and feed intake. When does received the common vetch diet, a lower parity value was found as compared with the does consumed the commercial diet (3.8 *vs* 5.0). However, the mean values of parities between the does fed the alfalfa diet and the vetch diet were not significantly ($P>0.05$) different (4.8 *vs* 3.8). Litter weight at one day postkindling, showed a significant ($P<0.05$) effect of the buck genotype. The does mated with the Mexican bucks produced heavier litters than the does mated with the oregonian bucks (540.3 *vs* 478.2 g).

INTRODUCTION

The efficiency of production and reproduction of rabbits is largely dependent upon adequate and proper feeding, the quantity and quality of feed provided to the breeding stock are important aspects, since a poor nutrition may result in production of small, weak, or dead kits or reabsorption of the entire litter. Similarly, overfat does may not carry their litters through the entire gestation period. Rabbits are herbivorous animals that can consume fairly large quantities of forage and one of these forages that has been used in several countries is alfalfa (CHEEKE *et al.*, 1982). This excellent forage from the nutritional point of view has some disadvantages as its high cost of production, high demand of water and low rate of growth in winter. For these reasons, other forage alternatives must be tried. Common vetch is a legume than can growth well in winter and requires less water for growing. Like other legumes, they add nitrogen to the soil by means of nitrogen-fixing bacteria and thus are particularly valuable as a soil-enriching crop. Common vetch for feeding rabbits has been studied scarcely and based on its chemical composition seems to be a forage that can replace alfalfa in some situation for does' diets.

The results presented here are part of a general program research on the use of common vetch for rabbits. The experiment was carried out to investigate if common vetch can replace alfalfa in a diet for breeding does without jeopardizing the reproductive performance.

MATERIAL AND METHODS

Animals and Housing

Forty-eight New Zealand White does from a commercial stock with an average body weight of 3.5 kg and 16 New Zealand White bucks, (eight of them imported from Oregon, USA and eight born in Mexico) were used in this experiment. The does were randomly divided in three groups of 16 does each. The treatments were allotted according to STEEL and TORRIE (1988) to the does, these animals were allocated in all wire cages (90x60x40 cm) and ear tagged for identification. The does were given an adaptation period to diets for one week. Feed and water were provided *ad libitum* during the 224 day experimental period.

The does were subjected to an intensive reproductive rhythm, two days postkindling the does were rebred and abdominal palpation was recorded on day 15th after mating, and non-pregnant does were immediately remated. The bucks were randomly allotted after each kindling, trying that one buck of each group at least mated one doe of each treatment. Wooden nestboxes, measuring 40x20x20 cm and provided with a layer of sawdust were

placed in the does' cages three days before parturition. Twenty-four hours postkindling, live kits in the litter were weighed, and weekly, all dead kits, tissue and soiled or wet nest material were removed from the nestbox. All litters were checked daily and dead kits removed. No fostering was practised. At 28 days the nestbox was removed and weaning occurred at this time.

Does were located in a rabbit building of 264 m^2 constructed of bricks, with solid concrete floor sloped for drainage and the ceiling was built with asbesto sheets. The rabbitry has open sides and roll-up curtains to control ventilation and temperature. The cages were arranged as single on double tiers units separated from the floor 70 cm.

The study was carried out in Chapingo, 40 Km from México City, 19°29' North latitude and 98°53' west longitude and altitude of 2240 above the sea level, with moderate climate ((CWo) (w) b(i') g) with rain in summer and a dry season in winter. The average temperature is 15.2°C and rainfall of 636.5 mm (GARCIA, 1981).

Diets

Alfalfa (*Medicago sativa)* and common vetch (*Vicia sativa*) were harvested at early bloom, sun-cured and ground for preparing the pelleted diets used in this experiment. Proximate analysis (A.O.A.C., 1980), VAN SOEST analysis (GOERING and VAN SOEST, 1970) and amino acid content (JONES *et al.*, 1981) of common vetch are shown in tables 1 and 2. The composition of the experimental diets is shown in table 3.

Table 1 : Proximate and Van Soest analysis of common vetch (dry matter basis)

Fraction	%
Dry matter	100.00
Crude protein	22.48
Crude fiber	23.16
Ether extract	2.43
Nitrogen free extract	41.23
Ash	10.70
Calcium	1.18
Phosphorous total	0.70
Neutral detergent fiber	35.67
Acid detergent fiber	26.68
Lignin	8.45

Table 2 : Amino acid composition of the vetch protein expressed as w/w %

Amino acid	%
Hydroxyproline	0.22
Aspartic acid	3.02
Threonine	1.18
Serine	1.10
Glutamic acid	2.60
Proline	1.39
Glycine	1.30
Alanine	1.66
Cystine	0.29
Valine	1.66
Methionine	0.35
Isoleucine	1.19
Leucine	2.12
Tyrosine	0.90
Phenylalanine	1.31
Histidine	0.61
Lysine	1.61
Arginine	1.35
Tryptophan	0.47

Three treatments were evaluated: T1, commercial diet; T2, alfalfa meal diet 60%; and T3, common vetch diet 60%. Each diet was provided to 16 breeding does. The response variables reported here are: litter size at birth, kits born alive at one day postkindling, litter weight at one day postkindling, number of kits weaned, litter weight weaned at 28 days, number of parities and feed intake for first gestation only.

Statitiscal analysis

Univariate analysis were performed for each trait studied. A fixed effect model, with treatment as the only fixed effect beside the mean, was used to analyze total number of parities per doe during the experimental period. Mixed models, including mean, treatment, buck genotype, parturition number and linear and quadratic covariables (days between 1st service and parturition, kits born alive, number of kits weaned) as fixed effects, and doe nested in treatment, and buck nested in genotype, as random effects, were used to analize litter traits. For feed intake mean, treatment, gestation length and age effects were considered. All traits were assumed to have normally distributed errors. Sums squares and solutions for fixed and random effects were obtained by the general linear model procedure of SAS (SAS Institute, 1985). Tukey's mean comparison procedure were used when applicable.

Table 3 : Composition of experimental diets

Ingredient	T1	T2	T3
		%	
Common vetch meal	C	--------	60.471
Alfalfa meal	O	60.471	--------
Soybean meal	M	6.000	6.000
Wheat bran	M	1.000	1.000
Sorghum	E	21.000	21.000
Tallow	R	5.500	5.500
Vegetable oil	C	0.500	0.500
Molasses cane		3.000	3.000
Dicalcium phosphate	I	1.000	1.000
Salt	A	0.500	0.500
Vitamin premix[1]	L	0.250	0.250
Mineral premix[2]		0.600	0.600
DL-Methionine	D	0.080	0.080
Ethoxyquin	I	0.045	0.045
Coccidiostat	E	0.050	0.050
TOTAL	T	100.000	100.000
Chemical analysis		%	
Dry matter	91.40	91.90	91.30
Crude protein	18.20	16.30	19.80
Ether extract	3.80	7.90	9.30
Crude fiber	21.50	24.00	17.50
Acid detergent fiber	22.50	25.30	20.40
Neutral detergent fiber	31.70	39.90	37.90
Lignin	6.40	7.40	3.70
Calcium	1.40	1.40	1.10
Phosphorous total	0.79	0.52	0.76
Calculated analysis			
DE, Kcal /kg		2511	2535
Lysine, %		0.68	1.20
Met + Cys, %		0.50	0.60
Arginine, %		0.70	1.10
Threonine, %		0.58	0.88

[1]Supplied the following per kg of feed: Vitamin A, 6000 IU; cholecalciferol,1000 IU; vitamin E, 50 IU.
[2]The mineral premix supplied the following per kg of feed: Co, 1.0 ppm.; Cu, 6 ppm; Zn, 50 ppm; Fe, 50 ppm; Mn, 8 ppm; I., 0.02 ppm

RESULTS AND DISCUSSION

Table 4 : Performance of does fed the experimental diets (mean ± SD)

Variables	T1 Commercial diet Vecht	T2 Alfa diet	T3 Common
Litter size at birth	8.49±2.5	7.49±2.9	7.66±2.1
Born kits alive at one day postkindling	7.06±2.9	6.25±3.3	6.68±2.8
Litter weight at one day, g postkindling	526.3±153.8	490.0±165.5	516.2±158.5
Number of kits weaned	5.61±3.0	4.79±3.0	4.98±3.0
Litter weight weaned at 28 days, g	3368.6±794.1	3017.2±974.6	3449.7±763.8
Number of Parities*	5.0±0.8 [a]	4.8±1.2 [a b]	3.8±1.7 [b]
Feed intake for 1st gestation, g	4369.5±372.8 [a]	4038.8±366.4 [b]	4037.4±365.5 [b]

* ($P<0.05$) ; a-b Means within the same row with no common superscript differ significantly ($P<0.05$)

Results of this experiment are show in table 4, for the variables studied no significant differences were found, except for number of parities and feed intake. When does received the common vetch diet, a lower parity value was found as compared with the does consumed the commercial diet (3.8 *vs* 5.0). However, differences between number of parities for the does fed the alfalfa diet and the vetch diet were not significant ($P>0.05$) (4.8 *vs* 3.8). The results of feed intake for the first gestation indicated that the does fed the alfalfa or the vetch diet were significantly lower ($P<0.05$) than the feed intake of the

commercial diet, approximately a 8% reduction. However, no significant differences (P>0.05) were detected between the does fed the alfalfa diet and the does fed vetch diet.

According to the results found in this experiment, the does fed the alfalfa or vetch diet had a litter size at birth slightly lower than the range of 8 to 10 reported by CHEEKE *et al.*, (1982). However, these results are similar to those found by MCNITT and MOODY (1990) in Louisiana with New Zealand White does (7.7).

In relation to litter weight at one day postkindling, a significant (P<0.05) effect of the buck genotype on this variable was found. The does mated with Mexican bucks produced heavier litters than the does mated with oregonian bucks (540.3 *vs* 478.2 g). A significant (P<0.01) linear and quadratic effect of the number of born alive on this variable was found. However, when the number of kits born was too high (16 kits) , these were too small and very often died (cuadratic effect) affecting the litter weight at one day postkindling. Another factor that had a significant effect (P<0.05) on this variable was the number of parity (P), it was observed that the weight of the litter increased until the 3th parity and later on decreased mildly (1stP, 437.7± 130.9; 2ndP, 495.8±148.9; 3th, 574.3±149.3; 4th, 523.5±172.3; 5th, 523.0±171.7; and 6th, 563.3±168.5).

The number of kits weaned was not significant (P>0.05) for treatment effect. However, significant linear and quadratic effects (P<0.05) were perceived on this variable by the number of born alive.

Parity and number of kits weaned had a significant effect (P<0.05) on the litter weight weaned at 28 days. It was found that the heaviest weight was found at the 2nd parity. Later on, the litter weight (g) was reduced 1stP, 3056.0±769.8; 2ndP, 3419.7±924.3; 3th, 3319.7±975.1; 4th, 3264.0±752.6; 5th, 3268.1±860.3; and the weight for the 6th litter was not recorded. MCNITT and MOODY (1990) have also reported that parity affects the mean litter weight at weaning as a result of the increase in milk production of the does as parity increased.

The overall results of total number of parities for the does fed the common vetch diet and subjected to the 2 day breeback was lower than that reported by PARTRIDGE *et al.* (1984) who found 8.9 litres per doe per year when the does were remated 24 hs after parturition and were fed a diet with 25.6% protein and 2868 kcal DE/kg. However, the number of parities (5.0) obtained with the does fed the commercial diet would be equivalent to the Partridge's, considering that this experiment lasted only 224 days. It is important to mention that the does fed the vetch diet required more services per conception and this may explain the low number of parities found in this treatment, although, the difference was not significant with the does fed the alfalfa diet. It has been reported that β-cyanoalanine occurs in common vetch mainly as its γ glutamyl derivative (RESSLER *et al*, 1963; cited by BUTTLER and BAILEY, 1973) this substance, has been found to be neurotoxic to the chick and the rat and in addition produces cystathioninuria in the rat (RESSLER *et al*, 1967; cited by BUTTLER and BAILEY, 1973). These previous findings may explain the reduced number of parities in the does fed the common vetch diet. These results suggest that in future research it would be advisable to measure this kind of compound since in a long term, the use of common vetch may affect the reproductive performance of does.

REFERENCES

A.O.A.C. 1980. Official Methods of Analysis (13th. ed.). Association of Official Analytical Chemists. Washington, D.C.

BUTTLER W.G., BAILEY R.W., 1973. Chemistry and biochemistry of herbage. **Vol. I.** *Academic Press.*

CHEEKE P.R., PATTON N.P., TEMPLETON G.S., 1982. Rabbit Production. *The Interstate Printers and Publishers*, Inc. Danville, Illinois. U.S.A.

GARCIA E., 1981. Modificación al sistema de clasificación climática de Koppen. México. Instituto de Geografía. Universidad Nacional Autónoma de México.

GOERING H.K., VAN SOEST P.J., 1970. Forage Fiber Analysis. Agricultural Handbook 379. U.S. Department of Agriculture.

JONES B.N., PAABO S., STEIN S., 1981. Amino acid analysis and enzymatic sequence determination of peptides by an improved ophthalaldehyde preculumn labeling procedure. *J. Liquid Chromatog.*, **4**, 565-586.

MCNITT I.G., MOODY G.L., 1990. Effects of month, breed and parity on doe productivity in Southern Louisiana. *J. Appl. Rabbit. Res.*, **13**, 169-175.

PARTRIDGE G.G., ALLAN S.J., FINDLAY M., CORRIGALL, 1984. The effects of reducing the remating interval after parturition on the reproductive performance of the commercial doe rabbit. *Animal Production*, **39**, 465-472.

SAS Institute, 1985. SAS USER'S Guide: Basics. SAS Institute Inc., Cary, N.C. U.S.A.

STEEL R.G.D., TORRIE J.H., 1988. Bioestadística: Principios y procedimientos. 2a ed. Ed. McGraw-Hill. México, D.F.