BIBLIOGRAPHY

BITAYAN, ELNORA V. APRIL 2013. Preference and Acceptability of Stale Bread as Feed for Rabbits. Benguet State University, La Trinidad, Benguet.

Adviser: Sonwright B. Maddul, Ph.D.

ABSTRACT

The study was conducted to determine the palatability and acceptability of stale bread as feed for rabbits. Five New Zealand white rabbits were distributed using the completely randomized design to the following treatments: T_1 = broken stale bread, T_2 = crumbled stale bread, T_3 = fine stale bread. The mean dry matter content of the experimental diets was 47.37%. Palatability and acceptability by rabbits did not differ among the dietary treatments. Crumbled stale bread was the most preferred with palatability index of 97.07%. Of all the three the diets offered (broken, crumbled and fine stale bread), acceptability index ranged from 12 – 17%.

INTRODUCTION

Rabbits have enormous reproductive and growth potentials which have yet to be harnessed in developed countries in the form of a profitable rabbit meat industry. Rabbit production is a means of utilizing small rural holdings in a profitable manner and as a more efficient means of converting low quality feed ingredients into meat for human consumption. Rabbit production can also be a family hobby for semi-rural and urban families and at the same time give the families a supply of very nutritious meat, with all amino acids for human requirements, that is low in cholesterol and high in Omega-3 fatty acids (McCroskey, 2000).

The cost of commercial feeds usually accounts for about 70% of total cost of rabbit production and therefore, to reduce the cost of commercial feed there is a need to use locally available feed resources. According to Cheeke (1986), one of the advantages of rabbit production in tropical countries is that rabbits can be fed forages and agricultural by-products that are not suitable for human consumption. In addition, rabbits do not compete for feedstuffs used for traditional livestock.

Current feeding practices vary widely in the tropics, depending on the types of feed material that are available locally. In Africa and Southeast Asia, feeds commonly given to rabbits include grasses, legumes, groundnut haulms and cowpea haulms, root crops, water plants and various herbs Aduku and Olukosi (1990). The feeding of stale bread and tortillas in Mexico has been reported by Lopez *et al*. (1999) and in the backyard system of rabbit production in Mauritius by Ramchurn and Dullull (2001).It is reported use as feed supplement for rabbits; however, stale bread is not fully utilized as another feed resource. In the locality, it is not known whether stale bread is being fed to rabbits.

There are no published data or information available on the utilization of stale bread as rabbit feed. Consequently, knowledge on palatability and acceptability of stale bread by rabbits is either inadequate or lacking.

Palatability refers to perceptions of a food's taste, smell, and texture. Palatability is important since there is nothing less nutritious than a food an animal will not eat. Although certain flavours, smells and textures of food are known to appeal more than others, the only way to assess the palatability of a particular food is conduct Palatability trials in the type of animal for which the food is intended. These usually involve offering the food to a sizeable number of animals in their normal environment, over several days, and assessing their level of consumption and enjoyment.

Stale bread is readily available from local bakeries and bread shops. Its utilization as rabbit feed is a means to avoid wastage of resources and to convert this waste into nutritious meat and income. To fully utilize such waste, it would need research that will demonstrate the potential of stale bread as feed supplement in order to improve rabbit production.

One of the solutions to the problem of rabbit raisers on how to cut feed cost is to use locally found materials that meet the daily requirements of the animals. The result of this study may help the rabbit raisers to lessen their expenses as well as add to their income. Furthermore, the findings of the study will provide necessary information on the preference of rabbits for stale bread.

The specific objective of the study was to determine the palatability and acceptability of stale bread by rabbits. The study was conducted at lower Tomay, Bahong, La Trinidad, Benguet from September 1 to September 17, 2012.

REVIEW OF LITERATURE

Commercial feeds are usually fed to rabbits but these are too expensive especially in developing countries. Therefore, to reduce the cost of feeds, alternative resource materials are exploited. Food wastes have been tried as a diet for rabbits by many researchers as an attempt to reduce the high cost of rabbit feed. For example, tomato skin and seeds (Alicata *et al*., 1988), dried orange and lemon pulp (Leto *et al*., 1984) were used for feeding meat rabbits. Unthreshed inflorescence or seed heads of mature grain amaranth plants as feed ingredient of concentrate diets of rabbits was examined by Bamikole *et al*. (2000).Feeding experiments have been done to prove the possibility of using stale bread for rabbit feeding and resulted in the reduction of feed costs.

Utilization of Bread as Rabbit Feed

In Saudi Arabia, Al-Shami and Mohammed (2009) investigated the effect of Wasted Bread Crumbs (WBC) or Rejected Dates (RD) as replacement of barley grains on growth performance and carcass traits of growing rabbits.Their data revealed that WBC was more efficient, resulted in good and higher growth performance and rabbits utilized it better than RD. Both WBC and RD reduced dressing % and increased head and viscera relative weights when compared with the control while, WBC reduced ($p>0.05$) abdominal fat relative weight and RD increased ($p>0.05$) abdominal fat relative weight. Both WBC and RD had no effect on chemical composition of rabbit's meat. The data indicated that WBC posses good energy source at different levels for rabbit feeding while RD were less fit and require further investigation.

According to Jenkins (1975), a 250 g of bread per day could supply 800 calories and 30 g of protein. This amount can also supply 30% energy requirement and 10% of dietary fiber. By weight, dry or stale bread has about the same feeding value as cereal grains. Jamora (1978) reported that stale bread has a protein content of about 9%, and can be used to provide up to 40% of the total ingredients.

Ramchurn and Dullull (2001) used 32 crossbred rabbits which were randomly allocated to four dietary treatments: *ad libitum* commercial rabbit pellets, 75% pellets and stale bread *ad libitum*, 50% pellets and stale bread *ad libitum*, and only *ad libitum* stale bread. No obvious health problem was encountered during the experiment. The parameters measured were feed intake and digestibility (dry matter, organic matter, crude protein, crude fibre and energy).Average feed intake was the highest with 100% commercial pelleted diet (128 ± 2.04 g DM/day) and lowest on 100% stale bread (58.5 ± 2.45 g DM/day), reflecting a 54% decrease in dry matter intake. The dry matter, organic matter and protein digestibility were higher on stale bread than on commercial pellets.

Palatability

Palatability is a measure of how readily animals will eat a food, and how much they will consume. There are two ways to test and measure the palatability of foods. The first palatability is called first bite preference. The measure of the animal's first impression of foods aroma and appearance. Because the novelty of a new diet can cause highs and lows in the first bite test. The second test is called the Total Volume Measurement. It determines the staying power or ability of diet to maintain the animal interest over time. This is the animals overall choice of food based on taste, texture for entire period (Phillip-Donaldson, 2003).

Acceptability

The measure of whether an animal will consume enough of a food to meet its caloric needs. To determine whether a food's acceptability changes with time of day and degree to which a food is appropriate for a given mealtime, preferences will be obtained in the morning Twenty-nine laboratory taste tests were conducted, each with from 27 to 38 consumers. During each test, one or more food products were tested for preference/acceptability and then rated for their appropriateness in 10 different use situations. Additional tests were conducted to assess any biasing effect of collecting the appropriateness data on the obtained acceptance ratings and the applicability of appropriateness scaling to conceptual foods. It is concluded that appropriateness ratings can be obtained in taste tests without jeopardizing the validity of preference/ acceptability judgments. In addition, appropriateness judgments obtained as part of routine sensory evaluation can provide valuable information to guide product development and to maximize food utility in the intended use situation by Ayala *et al*. (1998).

Effect of Particle Size on Performance

Physical form of forage may influence productive performance through the influence on mastication, microbial fermentation in the rumen, and the rate of passage and digestion in the gastro-intestinal tract Lu *et al.*, (2005). The method of processing the feeds, such as chopping, is also a factor which effects feed intake. When feed is chopped into short pieces, the length of the long fibers is decreased and the animals have less opportunity to select between the different parts of the feed. This leads to increased feed intake and reduced time for eating. However, when grass or hay is offered in long, unchopped form the animals have more opportunity to select between stem and leaf, which leads to

increased nutritive value of the feed consumed and increased time for eating. Omokanye *et al.* (2001) found that chopping of browse species before offering enhanced intake by around 60%.

Do Thi Thanh Van (2006) cited the research work of Kenney and Black (1984) who found that reducing the length of forage particles increases intake rate and preference for the short material. This principle appears toehold irrespective of the DM content of the forage.

Rabbits seem to perform better when fed pellets than when they are fed mixed grains or textured feeds, primarily because the animals are not able to sort out preferred items. For example, Jackel (1952) who reported that pelleted dehydrated alfalfa is preferred to alfalfa in its natural form. Rabbits, like most other animals, will select only the alfalfa leaves and leave the stems uneaten. This feeding practice results in a low-fiber diet and potential enteritis. Pellets need to be hard and durable, because rabbits prefer not to eat the fines. If an animal does eat too many fines or if the particle size is too small, there will be an increase in retention time in the gut, reduced gut motility, and enteritis. Large indigestible fiber particles are needed for normal cecal-colonic motility. Hypo motility of the gut predisposes an animal to enteritis. Feeding pellets of small diameter (<0.25 cm) will lower intake and ultimately weight gain due to increased feeding time (Maertens and Villamide, 1998). Feeding larger diameter pellets (>0.5 cm) results in greater feed wastage. Maertens and Villamide (1998) recommend a pellet length for rabbits of 0.8 to 1.0 cm because longer pellets will cause greater breakage and production of smaller pellets. McNitt *et al.* (1996) suggests that a solid and firm pellet of 0.63 cm in length and 0.47cm in diameter is optimum for rabbits.

Motedayen *et al*. (2001) concluded that the use of crumbled pellets for lactating rabbits having litters of 20–50day old result to minimize the feed waste by 12.4 % in control group and 0.7 % in experimental group without any adverse effects and it also cause an increase in growth rate of young rabbits by 13 %.

MATERIALS AND METHODS

Experimental Materials

A total of five rabbits, approximately 3 months old and of the New Zealand White breed was used in this experiment. The rabbits were purchased from a single source to minimize variations. The animals were treated against endo-and ecto-parasites following recommended practices. The rabbits were housed individually in elevated cages made of metal framework and wire screen.

White loaf bread, which is about 4 to 5 days from the expiry date, was collected from a selected bake shop in La Trinidad, Benguet. The stale bread were either broken into pieces and crumbles, or ground into fine particles to produce three forms by which the bread was offered to the experimental animals.

Experimental Procedure

The form of stale bread served as dietary treatments:

T_1 = Broken stale bread

T_2= Crumbled stale bread

T_3 = Fine stale bread

Preference and acceptability of stale bread were determined by feeding the rabbits with the dietary treatments in two experiments as follows:

Dietary Palatability Test

The experimental animals were given a choice from several diets of stale bread. The relative intakes of the diets were measured quantitatively to represent the response of the

animals. The cafeteria-style was used in which rabbits are given a selection of different food items presented in equal amounts simultaneously.

The preference trial lasted for 10 days in two phases: protocol conditioning and preference testing. A 5-day conditioning phase served to familiarize rabbits with each test diet. Following the protocol conditioning phase, a preference trial was conducted over 5 days. Data on the amount of feed offered and leftovers were gathered during the last phase.

Each dietary treatment was weighed and offered simultaneously in separate containers. Rabbits were offered 100 g of the test diets twice daily at 6:30 AM and 6:00 PM. Sufficient feed was placed in each container so that feed would not be depleted and force the rabbits to eat other feeds. Feed remaining from the previous feeding were weighed to determine amount consumed before the containers was refilled. The location of the containers in the cages was randomized at each feeding to prevent bias due to position. Drinking water was supplied *ad libitum* in earthen containers or crocks.

Dietary Acceptability Test

The dietary acceptance trial made use of the single choice selection in which experimental animals were not given a choice of diets. Only one test diet was offered to the experimental rabbits at a time for a period of 30 minutes. The same dietary treatments were tested in this trial involving the same experimental animals used in the palatability trial. Drawing of lots was used to determine which diet would be offered in sequence.

Each rabbit was offered 100 g of fine stale bread at 6:30AM for two days. The diet was withdrawn from the animals 30 minutes after this was offered and weighed for leftovers. At this time, the animals were fed with camote leaves and stems (not included in the test) for the rest of the day.Broken stale bread was offered in same amount and period

of time over two days. The last test diet, crumbled stale bread, was offered in same amount and period for the last two days of the experiment. The orders by which the test diets are offered were determined by drawing lots.

From each test diet, 50g of samples were taken for dry matter content determination. Samples were dried at 60 °C for 24 hours in a Memmert convection oven. The following data were gathered from both experiments

1. Amount of feed offered daily (g). The amount of each test diet given to an experimental animal was measured daily using a feed scale.

2. Amount of feed leftover (g). The amount of feed not consumed by each experimental animal was weighed before a new feed was given in the morning.

3. Weight of feed samples. Samples of the test diets were weighed before and after oven drying.

From the data gathered, the following indicators were computed:

1. Amount of dry matter in feed. The amount of dry matter in the test diet was computed as: $\%\text{Dry Matter} = \frac{\text{Weight of Feed Samples after Drying}}{\text{Weight of Feed Samples before Drying}} \times 100$

2. Total feed intake, fresh basis. This was obtained by getting the difference between the amount of feed offered to and feed refused by each experimental animal.

3. Daily feed intake, fresh basis. The daily feed intake was calculated as:

$$\text{Daily Feed Intake} = \frac{\text{Total Feed Intake}}{\text{Duration of Test}}$$

4. Total feed intake, dry matter basis. This was computed by multiplying the Feed intake, fresh basis, of each animal with the DM content of the test diet it consumed.

5. Relative palatability index. This was calculated as:

$$\text{Relative Palatability Index} = \frac{\text{Daily Feed Intake}}{\text{Highest Feed Intake}} \times 100$$

6. Relative acceptability index. This was calculated as:

$$\text{Acceptability Index} = \frac{\text{Amount of Feed Consumed}}{\text{Amount of Feed Offered}} \times 100$$

Data Analysis

Data on feed intakes, palatability index and acceptability index were subjected to one-way analysis of variance for completely randomized design of an experiment.

RESULTS AND DISCUSSION

Dry Matter Content of Test Diets

The dry matter content of the test diets is presented in Table 1.Crumbled and fine stale bread has 47.86% and 47.42% dry matter, respectively. Broken stale bread has adry matter content of 46.57%. The mean dry matter content of the experimental diets was determined to be 47.37%.

Palatability of Stale Bread

Feed intake. Table 2 shows the feed intake in fresh and dry matter basis of the experimental rabbits. Analysis of variance shows no significant difference among treatment means. The low feed intake of stale bread in palatability trial may due to the basic ingredients such as (yeast) used in preparing this product.This can be explained partly by the fact that rabbits adjust their feed intake according to the energy concentration of the feed. In the study of Ramchurn and Dullull (2001), the digestible energy of stale bread was 14.9 MJ/kg DM compared with 10.1 for the commercial pellets.Al-Shami and Mohammed (2009) also found that the relatively high carbohydrate and high digestible energy value may be related to lower daily feed intake by rabbits.

Table 1. Dry matter content of test diets

TREATMENT	% DRY MATTER
Broken stale bread	46.57
Crumbled stale bread	47.86
Fine stale bread	47.47

According to Samuel (2000), the low palatability of stale bread may be due to the ingredients used in preparing this commodity. Breads are treated with chemical preservatives for longer shelf life. Another factor involved is that bread is slightly acidic with a pH level of 5.3 to 5.8. Acidity of diets may result in low acceptance of the test diets.

Another associated lower feed intake of stale bread may due to the sizes of the test diets offered to the rabbits. According to Bath (1982), the factor that affect the feed intake by the animal include the size, and texture of the food. Feed quality and physical appearance such as dry matter and particle size may affect the feed intake of the animals Inoue *et al*. (1994) as cited by Samuel (2000).

Table 2 also, shows the dry matter intake of experimental rabbits. Analysis of variance shows no significant difference between treatment means. Rabbits fed under broken and crumbled stale bread have a dry matter intake (DMI) of 64.89 and 70.03 grams, respectively. Rabbits fed fine stale bread have a dry matter intake of 68.30 grams. These data are in agreement with Ramchurn and Dullull (2001) who observed that rabbits fed a sole diet of stale bread had an intake of 58.5 ± 2.45g/kg DM in air dry.

Table 2. Feed intake of the experimental rabbits during the palatability trial

	FRESHINTAKE (g)		DM INTAKE (g)	
TREATMENT	TOTAL	DAILY	TOTAL	DAILY
Broken stale bread	133.60	26.72	64.89	12.97
Crumbled stale bread	146.0	29.20	70.03	14.10
Fine stale bread	138.40	27.68	68.30	13.67

Palatability index. Table 3 shows the relative palatability of stale bread by rabbits. Analysis of variance shows no significant difference among treatment means. Based on the preference for the three test diets, crumbled stale bread was the most preferred by experimental rabbits, followed by fine stale bread and broken stale bread.

Acceptability of Stale Bread

Feed intake. Table 4 shows the amount of feed intake of experimental rabbits in the acceptability trial. Statistical analysis shows no significant difference among treatments means. The feed intake by rabbits in this experiment was lower compared to those in the palatability trial because of the shorter duration. Lower feed intake can be explained partly by the fact that rabbits adjust their feed intake according to the energy concentration of the feed.

Ramchurn and Dullull (2001) found out that the reduction in intake of stale bread increased as duration of study and the proportion of the stale bread increases. According to Atkins and Smith (1997), as cited by Ramchurn and Dullul (2001), the low intake in stale bread may be due to energy requirement by the animals. If the energy, protein and fiber content different widely from the animals requirement for energy, protein and fiber,

Table 3. Relative palatability index

TREATMENT	RELATIVE PALATABILITY	PREFERENCE RANKING
Broken stale	89.07	3
Crumbled stale bread	97.07	1
Fine stale bread	93.50	2

feed intake would be depressed. The imbalances of protein, calcium and phosphorus, relative to energy in the stale bread are the most likely explanation of low feed intake when only this feed was supplied.

Another associated reason for the lower acceptance by experimental animals is the size of test diets and baking process. Gidenne (1992) reported that the size and type of the fibre of the diet can affect the feed intake. McNitt *et al*. (1996) suggested that a solid and firm diets or a pellet of 0.63 cm in length and 0.47cm in diameter is optimum for rabbits. According to Maertens and Villamide (1998), feeding of small diameter (<0.25 cm) will lower intake and feeding larger diameter pellets (>0.5 cm) results in greater feed wastage.

Table 4 also shows the dry matter intake of experimental rabbits. Analysis variance shows no significant differences between treatment means. A rabbit fed under crumbled stale bread with dry matter intake (DMI) of 16.79 grams and rabbits fed under broken and fine stale bread with dry matter intake of 11.96 grams 14.32 grams, respectively.

Table 4. Feed intake of experimental rabbits during acceptability trial

	FRESH INTAKE (g)		DM INTAKE (g)	
TREATMENTS	TOTAL	DAILY	TOTAL	DAILY
Broken stale bread	25.0	4.17	11.96	2.03
Crumbled stale bread	35.0	5.83	16.79	2.80
Fine stale bread	29.0	4.83	14.32	2.39

Relative acceptability index. Analysis of variance shows no significant difference among treatment means (Table 5). Only one test diet was offered to the experimental rabbits at a time for thirty minutes. Among the three test diets offered, crumbled stale

bread (17.5) was the most liked by the experimental rabbits as shown by the acceptability ranking. The acceptability of stale bread was very low. This is because of voluntary feed intake factors of the animals such as the flavour, odor, taste, smell, physical texture, and size of the food.

It is well known that particle size of the diets may influence acceptability. Particle size and textures also may have some effect as evidenced by the fact that many animals will readily crack or rolled grains than to whole grains.The diet with the shortest particle size reduced feed intake of fattening rabbits, lactating does and suckling rabbits (21–30 d of age) by 7%, 10% and 30%, respectively (Nicodemus *et al.* 2006).

Table 5. Relative acceptability index

TREATMENT	RELATIVE ACCEPTABILITY	ACCEPTABILITY RANKING
Broken stale bread	12.50	3
Crumbled stale bread	17.50	1
Fine stale bread	14.50	2

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study on the preference and acceptability of stale bread by domestic rabbits was conducted at Lower Tomay, Bahong in La Trinidad, Benguet on September 2012.White loaf bread, about 4 to 5 days from the expiry date, were collected from a selected bake shop in La Trinidad, Benguet The stale bread were either broken into pieces and crumbles, or ground into fine particles to produce three forms by which the bread was offered to the experimental animals.

The dietary treatments in five replications and laid out incompletely randomized design were as follows: T_1 (broken stale bread), T_2 (crumbled stale bread) and T_3 (fine stale bread). From each test diet, 50g of samples were taken for dry matter content determination. Five New Zealand white rabbits were used in a palatability trial which lasted for 10 days and in acceptability trials carried out in two days for each form of stale bread. In the palatability trial, the cafeteria-style was used in which rabbits were given a selection of the diets presented in equal amounts simultaneously. Rabbits were offered 100 g of the test diets in separate containers twice daily at 6:30 AM and 6:00 PM. The location of the containers in the cages was randomized at each feeding to prevent bias due to position.

The same dietary treatments were tested in the acceptability trial involving the same rabbits used in the palatability trial. Only one test diet was offered to the experimental rabbits at a time for a period of 30 minutes. Drawing of lots was used to determine which diet would be offered in sequence. Each rabbit was offered 100 g of fine stale bread at 6:30AM for two days. The diet was withdrawn from the animals 30 minutes after this was

offered and weighed for leftovers. In both experiments, drinking water was supplied *ad libitum* in earthen containers.

The form of stale bread such as broken crumbled and fine did not have significant effect on relative palatability and acceptance by the experimental rabbits. Among the three diets offered to the rabbits, crumbled stale bread was preferred and accepted most by the experimental rabbits.

Conclusions

Stale bread, whether broken, crumbled or fine, has no apparent effect on palatability and acceptance by rabbits. Thus, stale bread can be fed to rabbits in any form. Crumbled stale bread was the most preferred by the rabbits among the three diets offered.

Recommendations

It is recommended that crumbled stale bread can be offered as alternative feed. For higher palatability and acceptability stale bread can be offered as toasted or dry to rabbits. However, this needs to be confirmed in a feeding trial involving growing and fattening rabbits.

LITERATURE CITED

ADUKU, A. O. And OLUKOSI. 1990. Rabbit management in tropics production processing. Utilization, marketing and economics, practical training future prospect, living book services, G. U. Publications. Pp. 23-26.

ALICATA, M. L., A. BONANNO, A. GIACCONE, G.LETO, D.BATTAGLIA. 1988. Use of tomato skins and seeds in the feeding of meat rabbits. *Rivista di Coniglicoltura 25:33*-36.

AL-SHAMI, S. A. and T.A. MOHAMMED.2009.Effect of Replacement of Barley Grains by wasted bread crumbs or rejected dates on Growth Performance and Carcass Traits of growing rabbits. Pakistan Journal of Nutrition, 8: 635-641.Retrieved on January 30, 2013 fromhttp://scialert.net/abstract/?doi=pjn.2009.635.641.

AYALA, G.X, J.P.CAMPBELL, M. ENGELBERG, S. OLSON, C. MORENO, and V. SERRANO. 1998. Nutrition communication for a Latino community: formative research foundation. Farm community health .Pp. 72- 87.

BAMIKOLE, M., A.EZENWA, M. K. ADEWUMI, A. B. VERALDEand S.A. ORISADEYI. 2000. Alternative feed resources for formulating concentrate diets of rabbits. 1. Unthreshed grain amaranth seed head. World Rabbit Science. 8 (3): 125-129.

BATH, D.L. 1982. By –products and Unusual Feedstuff in Livestock Ration. Western Regional extension publication. Pp. 15- 16.

CHEEKE, P.R. 1986.Potentials of Rabbit Production in Tropical and Subtropical agricultural system. Animal science. Pp. 15 – 16.

DO THI THANH VAN. 2006. Some animal and feed factors affecting feed intake, behavior and performance of small ruminants. Doctor's dissertation. Swedish University of Agricultural Sciences Uppsala. Retrieved from January 30, 2012 fr4om http:// pub.epsilon.slu.se./1108/1/PhD/-van –general – discussion- pdf.

GIDENNE, T. 1992. Effect of fiber level, particle size and adaptation period on digestibility and rate of passage as measured at the ileum and in the feces in the adult rabbit. British Journal of Nutrition 67:133-146.

JAMORA, D.S.1978. Successful Rabbit Raising Philippines. The Pipe Asian Publisher Association of the Philippines Inc. Pp. 3-5.

JENKINS, S. H. 1975. Principles of Bread and Bakery Technology. Toronto: Lester and orpen Ltd. P. 5.

JACKEL, S. S., W. SCHAEDER, and A.S. SCHULTZ.1952. Susceptibility and Insoluble Fraction of Crumb of Conventional and Bacterial Alpha Amylase Supplemented with White Bread .Cereal Chemistry 29:190.

LETO, G., M. L. ALICATA, A. BONANNO, M. BACCHI. 1984. Trials on the use of dried orange and lemon pulp for feeding meat rabbits. *Coniglicoltura***: 53**-58.

LOPEZ, M. H., LOSADA, S. SANDOVAL, R. BENNETT, L. ARIAS, J. RANGEL, R.SORIANO and J. CORTÉS. 1999**.** The influence of urban tourism on backyard agriculture: the rabbit as a new guest in the southeast of the Metropolitan area of Mexico City. Livestock Research for Rural Development (11)3: Retrieved on April 2012 from http://www.cipav.org.co/lrrd/lrrd11/3/los113.htm.

LU, C.D., J.R. KAWAS and O.G. MAHGOUB. 2005. Fibre Digestion and utilization in goats. Small ruminant. Pp. 45 -52.

MAERTENS, L., VILLAMIDE M. J. 1998.Feedings systems for intensive production: the rabbit nutrition. CAB. International de Blas Madrid Spain P.263.

McCROSKEY, R. 2000. Raising Rabbits in the Pacific Northwest. Canadian Centre for rabbit production Development. Surrey, BC Canada V4N 3T7.Retrieved onApril1, 2012 from *http://www.cipav.org.co/lrrd/lrrd18/02/samk18022.htm.*

MCNITT, J. R. CHEEKE, N. M. PATTON, and S. D. LUKEFAHR. 1996. The Rabbit production .Interstate Publishers, Inc. Danville, IL. NRC. United States Canadian Tables of Feed Composition.

MOTEDAYEN, M. H., F. TODEDEHGHAN, M.A. AKHAVIZADEGAN, B. TOHIDI and O. GHADAMPOUR. 2001. Practical Approach to minimize wastage in the Rabbitry. Arch. Razi Inc. (2001) 52.

NICODEMUS, N., J. GARCÍA, R. CARABAÑO and J. C. DE BLAS. 2006. Effect of a reduction of dietary particle size by substituting a mixture of fibrous by-products for lucerne hay on performance and digestion of growing rabbits and lactating does. Livestock Science100(2): 242-250.Retrieved on April 1, 2012 from http://www.journals.elsevierhealth.com/periodicals/livsci/article/PIIS0301622605003/abstract.

OMOKANYE, A.T., R.O. BALOGUN, O.S. ONIFADE R.A. AFOLAYAN and M. E. OLYEMI. 2001. Assessment of preference and intake of browse specie by Yankasa sheep at Shika Niger. Small Ruminant. Res. 42: 203-210.

PHILLIP-DONALDSON, D.2003. Pet Nutrition Guide: Pet food Palatability Research and future prospects, Book Services, H.R. Publications.Pp.236-238.

RAMCHURN, R. and Y.DULLULL. 2001. The intake and digestibility of stale bread by the domestic rabbit. *Livestock Res. for Rural Dev.* 13(3). Retrieved on April 2012fromhttp://www.cipav.org.co/lrrd/lrrd13/3/ram133.htm.

SAMUEL, S. 2000. "Brewing and baking". Ancient Egyptian materials and technology. Eds: P. T. Nicholson and I. Shaw. Cambridge: Cambridge University Press. P. 537.