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Effects of *Aspilia africana* on conception rates of rabbit does

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Abstract

The study was conducted to investigate the conception rates of rabbit does fed *Aspilia africana* as forage using thirty (30) Dutch breed rabbit does of average age of 6 months which were randomly divided into three treatment groups with ten does per treatment. The treatment consisted of T1 - mixed forages (*Ipomea batatas* leaves, *Centrosema pubescens, Musa sapientum* leaves, *Panicum maximum*) without *A. africana* (control), T2 - fresh *A. africana* and T3 - wilted *A. africana*. Each treatment was replicated five times with two does per replicate in a Completely Randomized Design (CRD). The rabbits in all the treatment groups were fed 300 g of the same concentrate diet which contained 18.0% crude protein (CP) and 2620 kcal ME/kg throughout the study and 500 g of mixed forages which consisted of *Ipomea batatas* leaves, *Centrosema pubescens*, *Musa sapientum* leaves, and *Panicum maximum* from the commencement of the experiment until parturition. The test forage was introduced in treatments 2 and 3 following parturition. Does in the control group (T1) continued on the mixed forages fed during acclimatization. After weaning at four weeks, the does were remated two weeks later. Two weeks after remating, the does were palpated in the lower abdomen to confirm pregnancy. When no pregnancy was found, *A. africana* was suspended for three weeks. Three weeks later, the does were mated again. The study revealed no significant ($P > 0.05$) differences in daily feed intake of does among the various treatment groups throughout the study. Gestation length (29.10, 29.40, 29.20 for T1, T2 and T3 respectively), receptivity (3, 3, 2 for T1, T2 and T3 respectively) conception rates (96, 96, 99 for T1, T2 and T3 respectively) and ovarian weights (0.20, 0.22 and 0.20 for T1, T2 and T3 respectively) of the does in the various treatment groups showed no significant differences ($P > 0.05$) before the introduction of the test plants (*A. africana*). During the period of administration of the test plant, the treated groups T2 and T3 had significantly lower ($P < 0.05$) mean values for receptivity (T2 and T3 = 1) compared to T1 (3), conception rates for T2 and T3 were 0% and T1 was 100%. The gestation length for the control was 30.5 days while gestation was not recorded for T2 and T3 since they did not conceive at all. The ovarian weight of the control T1 (0.20 g) was significantly higher ($P < 0.05$) than T2 and T3 both of which recorded 0.13 g for their ovarian weights. The study showed that the use of *A. africana* was deleterious to fertility in rabbits.

Keywords: conception, contraceptive, rabbits, reproduction.

Introduction

The relevance of animal protein in human and animal nutrition in Nigeria cannot be over emphasized. In recent times there has been a significant shortfall between the production and supply of animal protein to feed the ever increasing population (Akpan *et al.,* 2009). Nutritionists and other related workers have expressed grave concern at the ridiculously low level of animal protein supply in the developing countries (Ogbonna and Adebowale, 1993; Awonorin *et al.,* 1994). Animal protein in the diets of low income earners that constitute the majority of Nigerian populace is very low (Yusuf *et al.,* 2009). Average consumption of animal protein in this country is estimated at 4.5 g/head/day as against a minimum requirement of 35 g/head/day recommended by the Food and Agriculture Organization of the United Nations (Atsu, 2002). The production of the conventional protein and energy sources is still grossly inadequate in most developing countries of the world and often times, demand exceeds supply (Matthew *et al.,* 2010). Therefore, in order to meet the increasing demand for animal protein, emphasis needs to be given to non-conventional sources against the conventional sources such as cattle, sheep, goat, pig and poultry that would require more capital, space and time (Yusuf *et al.,* 2009). Efforts have to be directed towards boosting the micro-livestock sector (Akpan *et al.,* 2009). An example of such livestock is the rabbit. Rabbit (*Oryctolagus cunniculus)* is a non-ruminant herbivore which utilizes much undigested and unabsorbed feed materials as nutrient sources for maintenance and production (Hassan and Owolabi, 1996; Amaefule *et al.,* 2005; Henry *et al.,* 2009). A substantial part of rabbit feed can be provided from herbage crops and weeds (Zahraddeen, 2006). Rabbits are known to supply animal protein and provide a cheap source of meat for the Nigerian populace. This is evident in the widespread of small scale rabbitary in backyards in Nigerian cities

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(Henry *et al.,* 2009). Rabbit provides inexpensive source of meat that is low in cholesterol and fat, high in protein compared with beef, mutton and pork (Ensminger, 1991; Oguike and Ohaja, 2009). Rabbits can be described as a pseudo-ruminant scavenger capable of coprophagy with high feed conversion efficiency (Dada-Joel, 2010). Thus, rabbits offer an avenue for rapid transformation in animal protein production in the country. This is because of the possibility of high turnover rate in its production. Inspite of the numerous advantages of rabbit over other classes of livestock and recent advances of alternative sources for this micro-livestock in Nigeria, feed cost and scarcity still limit profitable rabbit production in the country (Ozuo and Anigbogu, 2009). This has been blamed on the rising needs of man for the same feedstuffs for his food and industrial use (Duruna *et al.,* 2006) which has led to the use of alternative feed sources which may not be suitable for human consumption in feeding animals (Oguike and Etim, 2010).

The new global search for forages suitable for feeding livestock has led to the investigation of many more Nigerian plants now than previously (Etim and Oguike, 2011). In Nigeria, many plants are used for feeding livestock, one of such plants is *A. africana*, which belongs to the Asteracea family, a perennial herb varying in height from 60 to 150 cm depending on rainfall. It is a common weed of field crops in West Africa and sometimes found in fallow land, especially the forest zone (Akobundu, 1987; Etim and Oguike, 2011). The plant is a weed used as feed for rabbits and hares (Burkil, 1985; Etim and Oguike, 2011). It is rich in saponins and tannins (phytoestrogens). However, the effects of some of these feedstuffs on the animal during the different physiological states are not certain (Oguike and Etim, 2010) but when used correctly, assures for the maintenance of normal body physiology and improved performance.

Eweka (2008) posited that the ovary of Wistar rats given aqueous extract of *A. africana* orally showed some cellular hypertrophy of the theca folluli and complete distortion/destruction of the basement membrane. Frandson (2003) stated that a number of plants produce substances that have estrogenic activity. This author also stated that estrogen is used in hormonal treatments to produce abortion in domestic animals. According to Burkil (1985) *A. africana* is used as abortifacient. Eweka (2008) documented that in some communities women boil and filter the leaves of *A. africana,* which they drink to prevent conception. The number of mating to conception varies and may depend on the re-mating interval, nutrition and environment (Yamani *et al.,* 1991). A conception rate of 60 to 90% was recorded by Partridge *et al.* (1981) for normal rabbit does. According to Aduku and Olukosi (1990), (pregnancy) gestation in rabbit may last between 28 to 32 days. There is a dearth of information on the effects of *A. Africana* on conception rates of does. The study aimed to investigate the consequences of feeding *A. africana* to rabbit does, to ascertain its effect on the conception rates of rabbit does.

Material and Methods

Experimental location

The research was conducted in the Rabbitry Unit of the Teaching and Research Farm of the College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Umudike is located within the tropical rainforest zone and the environment is characterized by rainfall of 2177 mm, while average ambient temperature is 26°C and relative humidity of 63-80%.

Experimental animals and management

Thirty (30) sexually mature nulliparous Dutch does and four (4) Dutch bucks with an average age of 6 months and average weight of 1.74 kg sourced from Akwa Ibom State were used for the study. A two week pre-experimental quarantine period was allowed to enable the animals to adjust to the new environment. The animals used were those of good performance record (based on good health). The animals were identified with tags and were single housed in pens in rabbit hutches. Both sexes were separated. Before mating and kindling all the animals were fed 300 g of concentrate formulated using maize offal (45.5%), palm kernel cake (30%), soybean meal (20%), blood meal (2.0%), bone meal (2.0%), vitamin-mineral premixes (0.25%) and salt (0.25%). The formulated feed contained 18.5% crude protein and 2620 kcal Metabolizable Energy/kg. The experimental animals were also offered 500 g/day of mixed forages which comprised of *Panicum maximum, Ipomea batatas leaves, Centrosema pubescens* and *Musa sapientum leaves.*

Mating of the does was carried out 2 weeks after commencement of the experiment at the ratio of 1 buck: 10 does. Receptivity was recorded according to the method reported by Berepubo *et al.* (1998); the combined observation of the three “vital signs” which are increased vascularization and turgescence (swelling) of the vulva, exposition of the rear quarters (tail goes up), arching of back and frequent micturition and any of the secondary signs which include scratching of the ear, rubbing of the chin on feed trough or waterer and aggressive restlessness, particularly towards the end of a one week observation period is considered intensive heat and attracted an arbitrary score of 5. Manifestation of any two vital signs with or without secondary signs was labeled “less intensive heat” and assigned a score of 3 or 2. One vital sign with or without secondary signs was recorded as mild heat and was scored 1. Mating in all the treatment groups was carried out within one week. The does were palpated in the abdomen 14 days after mating to confirm pregnancy. Immediately after parturition, 500 g/day of fresh *A. africana* and 500 g of wilted *A. africana* were introduced in treatments 2 and 3 respectively, together with the same concentrate diet fed and the same amount fed during acclimatization, while rabbits in the control group (T1) continued on the same forages and concentrate diets fed during acclimatization. Daily feed intake by the animals was measured by weighing the remnants of the forages and concentrate diets offered the previous day every morning of the next day before feeding the animals. This was done using a sensitive electronic weighing balance. The amount of forages and concentrate diets left were subtracted from the amount offered to obtain the daily feed intake (g). This was done during acclimatization (pre-experiment and during the experiment).

The kits were weaned at 4 weeks and the does were allowed 14 days of rest before they were remated to determine if pregnancy will occur while they were consuming *A. africana.* After 14 days, the does were palpated and it was observed that pregnancy did not occur. *A. africana* was suspended for 3 weeks and the does were given mixed forages. After 3 weeks, the does were remated and palpated on the 14th day and it was observed that pregnancy did still not take place. One month after remating, two does in each treatment group were slaughtered by severing the jugular. The carcasses were eviscerated and the ovaries were removed and weighed with an electronic scale. One month after remating, two does in each treatment group were slaughtered. The mode of slaughtering was by severing the jugular vein.

Experimental design and data analysis

The experiment was in a Completely Randomized Design with three treatments. The treatments consisted of mixed forages without *A. africana* (T1), fresh *A. africana* (T2) and wilted *A. africana* (T3). Ten (10) does were randomly assigned to each treatment. Each treatment was replicated 5 times with 2 does per replicate. The parameters analyzed were daily feed intake (intake of concentrate pre-experiment, intake of concentrate during experiment, intake of forages pre-experiment, and intake of forages during experiment), reproductive performance of the does (receptivity, conception rate, gestation length and ovarian weight before and during the period of administration of the experimental diet). The data generated were analyzed using ANOVA. Significant means were separated using LSD according to the methods of Steel and Torrie (1980).

Results

The effects of *A. africana* on conception rates of rabbit does were revealed. The result of the reproductive performance of the does before receiving *A. africana* as presented in Table 2 showed that there were no significant differences ($P > 0.05$) in all parameters tested. Before parturition, does in the three treatment groups had moderate receptivity (3, 3, 2) and average gestation period (29.10, 29.40, 29.20) respectively. The conception rate for the three treatment groups also showed no significant difference ($P > 0.05$) and was high and varied.

The results of the effects of *A. africana* on the reproductive performance are presented in Table 3. Receptivity for does in treatments 1, 2 and 3 were 3, 1, and 1, respectively. The conception rate for T1 was 100% while T2 and T3 does did not conceive at all (0%). The result of the ovarian weights showed no significant differences ($P > 0.05$) but the ovarian weight of does in the control group (T1) was the highest (0.20 g) while T2 and T3 had the lowest numerical mean value of 0.13 g.

Discussion

As presented in Table 1, no significant differences ($P > 0.05$) were observed in the daily intake of both forages and concentrate diets by animals in the various treatment groups, pre-experiment and during experiment.

As shown in Table 2, the moderate receptivity and gestation period observed for does in the three treatment groups is in line with the report of 28-32 by Aduku and Olukosi (1990).The high and varied conception rates observed for does in all the treatment groups may be associated with the nutrition and environment as observed by Yamani *et al.* (1991). The conception rate of 96 to 99% obtained in the experiment was higher than that (60-90%) obtained by Patridge *et al.* (1981).

Table 1. Daily feed intake (g) of rabbit does fed *A. africana.*

Feed	T1	T2	T3	SEM
Intake of concentrate pre-experiment	258.33	261.67	258.33	22.93
Intake of concentrate during experiment	260.00	261.50	259.50	26.59
Intake of forages pre-experiment	308.33	316.27	316.00	55.08
Intake of forages during experiment	316.67	321.67	323.67	55.68

Table 2. Reproductive performance of does before receiving *A. africana*.

Parameters	T1	T2	T3	SEM
Receptivity	3	3	2	0.33
Conception rate (%)	99	96	99	3.00
Gestation length (days)	29.10	29.40	29.20	0.23
Ovarian weight (g)	0.20	0.22	0.20	0.06

^{a,b,c} means in same row with different superscripts are significantly different (P < 0.05).

Table 3 revealed the effects of *A. africana* on the reproductive performance of does, does in T1 were more receptive to bucks than does in T2 and T3. The ease with which the does in T1 accepted the buck could be attributed to hormonal action on the reproductive organs of the does as reported by Hulls *et al.* (1991). The increase in weight of the vulva was indicative of animals in ovarian growth/oestrus and hence the high receptivity observed in this group. The decrease in receptivity observed in does in T2 and T3 could be attributed to lack of manifestation of oestrus as well as follicular growth which may be as a result of non-release of gonadotrophins from the anterior pituitary of the does to stimulate ovarian activities. This low receptivity of the *A. africana* treated groups (T2 and T3) could be associated with the effects of the test plant (*A. africana*) on the ovary. The non-conception of does fed fresh and wilted *A. africana* (T2 and T3) may be attributed to the influence of the test plant on reproductive activity of the does which could have manifested in low receptivity of the does to the bucks and non-conception. The cause of non-conception of does in treatments 2 and 3 could be suggestive of the contraceptive effect of *A. africana* as reported by Eweka (2008). It is suggestive that the test plant could have caused the non-conception in does in T2 and T3 as it was reported to be rich in saponins and tannins (phytoestrogens). The phytoestrogen could have perturbed the manifestation of estrous, implantation and conception which is consistent with the findings of Oluyemi *et al.* (2007) that the presence of phytoestrogens like saponins and essential oils is suggestive of the negative influences of *A. africana* on the estrous cycle. The inhibitory effect of steroidal saponin has been documented by Tamura *et al*. (1997). High levels of saponins and other phytoestrogen cause hormonal imbalances. They have been found to reduce fertility in animals upon continuous administration. Phytoestrogenic plants have both estrogenic and anti-estrogenic effects on mammalian systems. They prevent implantation and other estrogen-dependent activities in the reproductive system. They do this by causing hormonal imbalances in the systems of the subject concern. Hormonal balance is required for effective reproduction in animals. This finding is also in line with the report by Eweka (2008) that the ovary of Wistar rats given aqueous extract of *A. africana* orally showed some cellular hypertrophy of the theca folliculi, and complete distortion/destruction of the basement membrane. He also observed degenerative and atrophic changes in the oocyte and granulosa and also marked vacuolation appearing in the stroma cells when compared to the control sections. Furthermore, the result of this experiment was also in line with the findings of Burkil (1985) that *A. africana* leaves may be used as abortifacients. Abortifacients are likely to cause non-conception. It could also be that *A. africana* produces excess estrogen, and with excess estrogen, conception cannot take place. This is in line with the report by Frandson (2003) that a number of plants produce substances that have estrogenic activity. Any hormone that can produce abortion can also cause non-conception. It is unknown if this is the reason for the non-conception observed for does in T2 and T3 which were fed *A. africana*. From the results of this study, it is suggestive that *A. africana* may have some contraceptive or anti-fertility properties. Moreover, the differences observed in the ovarian weights of does in the three treatment groups could be as a result of the degenerative effects of *A. africana* on the ovary as reported by Eweka (2008). This may have been the cause for the lack of conception observed in does in T2 and T3 as manifested in the reduction in the size of the ovary. The higher mean ovarian weight (0.20 g) of T1 may have led to the higher conception rate.

In conclusion, does fed *A. africana* consistently recorded lower values than does in the control group. This indicates that *A. africana* may have some deleterious effects on fertility. It could therefore be recommended for feeding animals not meant for breeding.

Table 3.Effect of *A. africana* on the reproductive performance of does.

Parameters	T1	T2	T3	SEM
Receptivity	3	1	1	0.33
Conception rate (%)	100	0	0	0.00
Gestation length (days)	30.50^{a}	0^{b}	0^{b}	2.67
Ovarian weight (g)	0.20	0.13	0.13	0.02

^{a,b,c} means in same row with different superscripts are significantly different (P < 0.05).

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