Influence of Oral Whole Extract from Moringa Oleifera on Semen Characteristics of Rabbits

El-Harairy, M. A.*; Sh. M. Shamiah** and A. E. Ghodaia**


ABSTRACT

The aim of this work was to study the effect of oral administration of whole extract from Moringa oleifera (MO) at levels of 0, 60 and 120 mg/head for 21 days on performance and semen characteristics of rabbit bucks. Total of 12 adult New Zealand rabbit bucks having live body weight (LBW) of 2304-2750 g/kg and at six month of age were divided into three similar groups (n = 4 in each). Bucks in the 1st group were given 3 ml sterile distilled water (Control, G1), while those in the 2nd and 3rd groups were given 3 ml distilled water containing 60 (G2) or 120 (G3) mg from the whole extract of MO. Bucks in all groups were treated as daily oral administration for 21 days before semen collection. All bucks were fed commercial complete feed diet and kept under the same managerial and climatic conditions. Semen was collected twice a week for 8 weeks. On day of semen collection, reaction time (RT) was calculated and semen was evaluated for volume (SV), pH value, mass (MM) and progressive (PM) motility, sperm livability (SL) and abnormality (SA) percentages, sperm cell concentration (SCC), total sperm output ejaculate (TSO), damaged acrosome (DA) and response to osmotic test at osmolality level of 50 mOsm/l for 30 min at 37°C (curled spermatozoa, CS). The obtained results revealed insignificant effect of MO on LBW of bucks. RT and percentages of MM, PM, SL, SA, SCC, TSO, DA and CS were improved (P<0.05) by MO at both levels. Semen pH value did not differ in G2 or G3 from that in G1, but pH value was higher (P<0.05) in G3 than in G2. SV increased (P<0.05) by about 27% only in G3 as compared to that in G2. RT and all physical semen characteristics were affected (P<0.05) by collection week, except semen pH value and DA percentage, which showed insignificantly inconsistent trend of changes throughout the collection period. RT and SA decreased (P<0.05), while SV, MM, PM, SCC and TSO increased (P<0.05) by advancing collection week. SV and CS showed inconsistent (P<0.05) trend of change during the collection weeks. The effect of interaction between treatment and collection week was not significant on RT and all semen characteristics studied. Rabbit does mated by bucks in G2 showed the best results reproductive performance, in terms of the highest kindling rate, total number of borns, total and live litter size at birth and viability rate at weaning, but the differences were not significant. Also, does mated by bucks in G3 showed the highest (P<0.05) average bunny weight at birth. In conclusion, moringa oleifera extract at a level of 60 mg/h as oral administration for 21 days has significant value in improving the antioxidant status and could serve as a supportive treatment in the nutritional management to improve semen production of rabbit bucks, and consequently increasing reproductive performance of rabbit does mated by this semen.

Keywords: Rabbit bucks, semen, Moringa oleifera extract, fertility.

INTRODUCTION

In many tropical and subtropical countries, various parts of Moringa oleifera (leaves, fruits, immature pods, and flowers) are incorporated into the traditional food of humans (Anhwange et al., 2004). A wide variety of nutritional and medicinal virtues have been attributed to its roots, bark, leaves, flowers, fruits, and seeds (Anwar et al., 2007; Kumar et al., 2010). Phytochemical analyses have shown that its leaves are particularly rich in potassium, calcium, phosphorous, iron, vitamins A and D, essential amino acids, as well as such known antioxidants such as β-carotene, vitamin C, and flavonoids (Bennett et al., 2003; Aslam et al., 2005; Manguro and Lemmen, 2007; Amaglo et al., 2010; Gowrishankar et al., 2010). Polyphenolic compounds which are often abundant in beverages derived from plant origin, such as herbal teas and teas, may contribute to the inhibitory effect of diets on oxidative stress. In this respect, the antioxidant effect of Moringa oleifera leaf extract and fruit was explained by Luqman et al. (2012) in term of the presence of polyphenols, tannins, anthocyanin, glycosides, and thiocarbamates, which remove free radicals, activate antioxidant enzymes, and inhibit oxidases. In addition, Moringa oleifera was reported to prevent effectively, morphological changes and oxidative damage in lens of rats by enhancing the activities of antioxidant enzymes, reducing the intensity of lipid peroxidation and inhibiting generation of free radicals (Sreelatha and Padma, 2009) and suppress formation of reactive oxygen species (ROS) (Sofidiya et al., 2006; Ogbunugafor et al., 2011).

Semen quality is the guarantee of successful insemination in breeding rabbits. There are many endogenous and exogenous factors affecting reproduction. Administration of antioxidants such as vitamin E, selenium, vitamin C, and carotenoids may reduce the oxidative stress and improve sperm motility (Castellini, 2008). It is important to investigate the protective properties of Moringa oleifera on testicular function. Therefore, aim of this paper is to study the effect of oral administration of whole extract from Moringa oleifera at levels of 0, 60 and 120 mg/head for 21 days on performance and semen characteristics of rabbit bucks.

MATERIALS AND METHODS

Animals:

Total of thirty adult New Zealand rabbit bucks having live body weight of 2304-2750 g/kg and at six months of age were divided into three similar groups (4 animals in each) and allowed to acclimatize for 7 days in their respective cages. Bucks in the 1st group were given 3 ml sterile distilled water (Control, G1) at the same times of treatments in other groups. Bucks in the 2nd and 3rd groups were given 3 ml distilled water containing 60 (G2) or 120 mg (G3) from whole extract of Moringa oleifera (each capsule contained 500 mg
whole plant powder, Dynamic Health Co., USA). Bucks in all groups were treated as daily oral administration for 21 days.

All bucks were fed commercial complete feed diet (16% CP and 2850 Kcal/kg diet energy) and kept under the same managerial and climatic conditions.

Semen collection:

Semen was collected twice a week early in the morning (7 a.m.) for 8 weeks as a collection period. Immediately after collection, the ejaculates were transferred to the laboratory and were placed in a water bath at 30°C and care was taken to avoid exposure of the semen to any unfavorable conditions during or after collection. On day of semen collection, reaction time was calculated in term of time elapsed from introducing female to male up to complete ejaculation

Semen evaluation:

Semen was evaluated for determination of semen volume with gel, semen pH value and mass motility immediately after collection. Percentage of progressive sperm motility in each semen sample was determined using research microscope supplied with hot stage adjusted to 37°C by assessment of degree of movement of spermatozoa in about 0.5 ml diluted semen.

Live sperm percentage was determined by eosin (1.67%) and nigrosin (10%) mixture stain and sperm abnormality percentage was estimated during the examination of live/dead sperm percentage at a high power magnification (x 400), the morphological abnormalities of spermatozoa were also determined per 200 sperm. Sperm cell concentration was determined by direct cell count using a microscope (x 200) and a Neubauer Hemocytometer. Total sperm output/ejaculate (TSOP) was calculated by multiplying sperm cell concentration/ml (SCC) by ejaculate volume (EV) as the following:

$$\text{TSOP} (x 10^9/\text{ejaculate}) = \text{EV (ml)} \times \text{SCC (x 10^9/ml)}$$

Acrosome status:

Examination of the acrosome status was carried out by adding one drop of diluted semen incubated at 37°C to one drop of sodium citrate (2.9%) at the same temperature, then the mixture was placed on a slide to make a smear, which was dried at 37°C. The dried slides were fixed in 10% formal solution for 15 minutes and washed by tap water for 15 minutes and stained with Gimsa stain at 37°C for 3 hours. Then the stained slides were washed by tap water for 15 minutes and dried at 37°C. The prepared slides were examined by research microscope at higher magnification (x 100) for determination of spermatozoa with and without intact acrosome per 200 spermatozoa in each field. The acrosome stained light purple dark pink, while sperm remains unstained. Percentage of spermatozoa with intact acrosome was calculated.

Hypo-osmotic swelling test (HOS-test)

The response of buck spermatozoa to osmotic tests was assessed using solution prepared with fructose (1.25%) and Na-citrate (2.9%) in distilled water (3 times) to give osmolarity of 300 mOsm using a freezing-point depression osmometer (Osmett A, Model 5002, Fisher Scientific, Pittsburg, PA, USA). Then, distilled water was added to reach osmolality level to 50 mOsm using osmometer. One drop of diluted semen was added to one ml of the hypo-osmotic solution with osmolarity of 50 mOsm into glass tube and the mixture was immediately examined in semen incubated for 30 min at 37°C. A semen smear from the mixture was made and dried at the same temperature. The slides were stained with eosin-nigrosine mixture stain.

All prepared slides were examined and numbers of spermatozoa with curled tail were determined using research microscope at (x 400). Two hundred spermatozoa per slide were counted and percentage of spermatozoa having curled tails was calculated.

Statistical analysis:

Data were analyzed by two-way analysis of variance (ANOVA) using the general linear model procedure according to SAS (2004). Values were considered significant at P<0.05. The significant differences among groups or sampling times were tested using Duncan’s multiple range test (Duncan, 1955).

The percentage values were subjected to arcsine transformation before performing the analysis of variance. Means were presented after being recalculated from the transformed values to percentages. Data were expressed as mean ± standard error.

RESULTS AND DISCUSSION

Live body weight of rabbit bucks:

Data in Table 1 revealed insignificant effect of Moringa oleifera (MO) treatment on LBW of bucks, although there was a tendency of reduction in LBW of bucks treated with both MO doses (G2 and G3) as compared to control group (G1) during treatment and semen collection periods.

In accordance with the present results, Chumark et al. (2008) found that dietary components of MO were reported to increase the body weights of rats significantly with increased MO concentration, while no significant change occurred in rabbits. Contrarily, Nuhu (2010) noticed that offering weaner rabbits a diet containing Moringa leaf meal significantly (P<0.05) increased daily weight gain when compared to a control diet.

Table 1. Effect of Moringa oleifera (MO) treatment on average live body weight of rabbit bucks during the experimental period.

<table>
<thead>
<tr>
<th>Live body weight (g/h)</th>
<th>G1 (control)</th>
<th>G2 (60 mg MO/h)</th>
<th>G3 (120 mg MO/h)</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial (start of treatment)</td>
<td>2507.1</td>
<td>2500.0</td>
<td>2550.0</td>
<td>182.04</td>
</tr>
<tr>
<td>Final (end of semen collection)</td>
<td>2807.1</td>
<td>2635.7</td>
<td>2721.4</td>
<td>150.48</td>
</tr>
<tr>
<td>Changes</td>
<td>300.0</td>
<td>135.7</td>
<td>171.4</td>
<td>-</td>
</tr>
</tbody>
</table>

In addition, Fahey et al. (2001) mentioned that the increase in the body weight of rats might be due to the fact that MO is rich in amino acids, vitamins and minerals particularly iron (Subadra et al., 1997; Faye, 2011). The reported significant increase in body weights
of rats might also be attributed to captivity, where energy expenditure is minimal (Fadi et al., 2010).

**Reaction time and physical semen characteristics: Effect of MO treatment:**

Results presented in Table 2 show that effect of MO treatment was significant on reaction time (RT) and all semen characteristics studied. Reaction time, and percentages of mass motility (MM), progressive motility (PM), livability (SL), abnormality (SA), concentration (SCC), total sperm output (TSO), damaged acrosome and curling of spermatozoa were significantly (P<0.05) improved by MO treatment at both levels. However, semen pH value did not differ significantly in G2 or G3 from that in G1, but pH value was significantly (P<0.05) higher in G3 than in G2. Semen volume significantly (P<0.05) increased by about 27% only in G3 as compared to the G1, but did not differ from that in G2.

According to these results, treatment of rabbit bucks with MO at levels of 60 or 120 mg/h had beneficial effects on improving reaction time and all physical semen characteristics of rabbit bucks.

**Table 2. Effect of *Moringa oleifera* (MO) treatment on reaction time and semen physical characteristics of rabbit bucks during the collection period (Overall mean).**

<table>
<thead>
<tr>
<th>Item</th>
<th>G1 (Control)</th>
<th>Experimental group</th>
<th>G3 (120 mg MO/h)</th>
<th>#SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reaction time (s)</td>
<td>20.71‡</td>
<td>14.29‡</td>
<td>11.88a</td>
<td>2.953</td>
</tr>
<tr>
<td>Semen pH value</td>
<td>7.49ab</td>
<td>7.14b</td>
<td>7.59a</td>
<td>0.053</td>
</tr>
<tr>
<td>Semen volume (ml)</td>
<td>0.681†</td>
<td>0.756b</td>
<td>0.867‡</td>
<td>0.057</td>
</tr>
<tr>
<td>Mass motility (%)</td>
<td>70.42‡</td>
<td>82.29a</td>
<td>83.45a</td>
<td>1.958</td>
</tr>
<tr>
<td>Progressive sperm motility (%)</td>
<td>74.79a</td>
<td>83.33a</td>
<td>84.70a</td>
<td>0.421</td>
</tr>
<tr>
<td>Live sperm (%)</td>
<td>75.45a</td>
<td>87.71a</td>
<td>88.25a</td>
<td>0.582</td>
</tr>
<tr>
<td>Sperm abnormality (%)</td>
<td>20.92a</td>
<td>14.37ab</td>
<td>12.08a</td>
<td>2.242</td>
</tr>
<tr>
<td>Sperm concentration (x10⁶/ml)</td>
<td>429.5a</td>
<td>593.7a</td>
<td>558.3b</td>
<td>18.14</td>
</tr>
<tr>
<td>Total sperm output (x10⁹/ejac.)</td>
<td>293.3b</td>
<td>469.3b</td>
<td>485.6b</td>
<td>10.316</td>
</tr>
<tr>
<td>Damaged acrosome (%)</td>
<td>15.04b</td>
<td>12.29b</td>
<td>12.25b</td>
<td>0.485</td>
</tr>
<tr>
<td>Hypo-osmotic swelling test (%)</td>
<td>36.04b</td>
<td>35.79b</td>
<td>38.88a</td>
<td>1.346</td>
</tr>
</tbody>
</table>

Means denoted within the same row with different superscripts are significantly different at P=0.05.

Generally, reaction time (RT) of NZW rabbit bucks ranged between 13.0 and 24.5 sec (Safaa et al., 2008), 26.7-27.16 sec (Mansour, 2010), 11.49-23.39 sec (El-Tohamy et al., 2012). The present values of reaction time are within these ranges. The present values of physical semen characteristics are within reference values in various rabbit breeds as reported IRGG (2005), being 0.34-0.9 ml for semen volume, 30-90% for progressive motility, 250-600 x 10⁶/ml for sperm cell concentration, and 7.1 for pH value. However, range of live sperm from 69.90 to 89.13% was reported by Mansour (2010) and El-Tohamy et al. (2012). Meanwhile, total sperm abnormalities was 15.40-16.79% (El-Tohamy et al., 2012); total sperm output was 208.92-289.03 x10⁶/ejaculate as reported by El-Tohamy et al. (2012).

Although the present results indicated improvement of sexual desire of bucks in term of reducing the reaction time in G2 and G3 treated with MO as compared to G1 (control), Sudha et al. (2010) found that methanolic extract of MO does not affect sexual behavior or semen androgen level but enhances seminiferous tubules, testis and epididymal weight and seminal vesicles in the male rats. This improvement may be due to increasing testicular weight of bucks treated with MO as compared to control (unshown data). Increasing testicular weight of bucks treated with MO may lead to testicular volume and number of Leydig cells responsible for testosterone secretion. Improving semen volume may reveal pronounced effect of MO as antioxidant on accessory sex glands and testicular tissues (spermatocytes) within the seminiferous tubules of the testis as well as on epididymal spermatozoa (Abdel-Khalek et al., 2001).

In this respect, several authors reported that some medicinal plants are extensively used as aphrodisiac to relieve sexual dysfunction, or as fertility enhancing agents. They provide a boost of nutritional value thereby improving sexual performance and libido (Yakubu et al., 2007; Sumalatha et al., 2010). In addition, Priyadarshani and Varma (2014) found that the administration of MO leaf powder in the treated diabetic male mice with leaf powder of MO leaves showed significantly higher testes and epididymis weight in comparison with diabetic control animals. These effects may be due to that MO leaves are excellent source of vitamin B, calcium, protein and potassium. Beta-carotene and other phytochemicals with known powerful antioxidant ability (Kaempferol, Quercetin, Rutin and Caffeoylquinic acids); powerful antioxidant vitamins (C, E, and A) and essential micronutrients with antioxidant activity (Selenium and Zinc) as explained by several authors (Fuglier, 1999; Jaiswal et al., 2009; Vongsak et al., 2013). Moreover, MO leaves possess tremendous anti-oxidant properties that ameliorate the deleterious effect of alcohol on pre-pubertal testes of rats (Bassey et al., 2013).

As proved in our study, Priyadarshani and Varma (2014) demonstrated that *Moringa* leaf powder administration for 21 days treatment significantly increased sperm motility, reduced sperm abnormalities including headless sperm, round head sperm and amorphous head sperm, and significantly increased sperm count. Also, Radwan et al. (2015) showed that the rats treated with MO leaf extract (MOLE) significantly lowered DNA fragmentation and morphological sperm abnormalities. However, Obembe et al. (2015) reported that the long term exposure of male rats to MO resulted no significant difference in sperm motility and number of normal sperm cells among the groups, while increased sperm count, without affecting the quality of sperm. Awodele et al. (2012)
El-Harairy, M. A. et al.

reported that sperm motility and sperm morphology were unaffected following *M. oleifera*. While, sperm count decreased following MO administration.

**Effect of collection week:**

Reaction time and physical semen characteristics were significantly (P<0.05) affected by collection week, except semen pH value and DA percentage, which showed insignificantly inconsistent trend of changes throughout the collection period (Table 3). By advancing collection week, RT and SA significantly (P<0.05) decreased, while SV, MM, PM, SCC and TSO significantly (P<0.05) increased. However, SV and CS showed significantly (P<0.05) inconsistent trend of change (Table 3).

**Effect of interaction:**

Analysis of variance revealed that the effect of interaction between treatment and collection week was not significant on reaction time and semen characteristics studied. According to these effects, results illustrated in Figure 1 indicated marked reduction in RT in all groups, and increasing pH value and SV in G2 and G3 as compared to G1.

Table 3. Effect of collection week on reaction time and semen physical characteristics of rabbit bucks (Overall mean).

<table>
<thead>
<tr>
<th>Collection week</th>
<th>RT (sec)</th>
<th>Semen pHe value</th>
<th>SV (ml)</th>
<th>MM (%)</th>
<th>PM (%)</th>
<th>SL (%)</th>
<th>SA (%)</th>
<th>SCC (10⁶/ml)</th>
<th>TSO (10⁶)</th>
<th>DA (%)</th>
<th>CS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26.56</td>
<td>7.41</td>
<td>0.522</td>
<td>67.22</td>
<td>63.89</td>
<td>85.11</td>
<td>12.56</td>
<td>353.3</td>
<td>183.9</td>
<td>14.11</td>
<td>35.89</td>
</tr>
<tr>
<td>2</td>
<td>17.67</td>
<td>7.46</td>
<td>0.911</td>
<td>80.0</td>
<td>73.89</td>
<td>87.33</td>
<td>12.00</td>
<td>425.4</td>
<td>378.6</td>
<td>12.22</td>
<td>32.56</td>
</tr>
<tr>
<td>3</td>
<td>24.00</td>
<td>7.46</td>
<td>0.761</td>
<td>81.11</td>
<td>84.44</td>
<td>86.22</td>
<td>10.67</td>
<td>477.1</td>
<td>366.6</td>
<td>13.35</td>
<td>34.22</td>
</tr>
<tr>
<td>4</td>
<td>14.78</td>
<td>7.30</td>
<td>0.722</td>
<td>80.0</td>
<td>87.22</td>
<td>88.22</td>
<td>10.67</td>
<td>532.2</td>
<td>389.0</td>
<td>12.44</td>
<td>30.22</td>
</tr>
<tr>
<td>5</td>
<td>10.89</td>
<td>7.29</td>
<td>0.839</td>
<td>84.44</td>
<td>90.56</td>
<td>88.11</td>
<td>11.11</td>
<td>573.3</td>
<td>495.6</td>
<td>13.22</td>
<td>33.67</td>
</tr>
<tr>
<td>6</td>
<td>10.33</td>
<td>7.51</td>
<td>0.656</td>
<td>81.11</td>
<td>83.33</td>
<td>87.78</td>
<td>11.78</td>
<td>571.0</td>
<td>377.9</td>
<td>13.11</td>
<td>34.56</td>
</tr>
<tr>
<td>7</td>
<td>10.88</td>
<td>7.46</td>
<td>0.767</td>
<td>76.11</td>
<td>84.44</td>
<td>86.67</td>
<td>11.11</td>
<td>617.7</td>
<td>463.6</td>
<td>12.89</td>
<td>34.44</td>
</tr>
<tr>
<td>8</td>
<td>9.89</td>
<td>7.38</td>
<td>0.989</td>
<td>80.00</td>
<td>86.60</td>
<td>87.67</td>
<td>11.11</td>
<td>666.6</td>
<td>673.2</td>
<td>14.22</td>
<td>33.00</td>
</tr>
<tr>
<td>±SEM</td>
<td>1.55</td>
<td>0.065</td>
<td>0.093</td>
<td>3.197</td>
<td>3.074</td>
<td>0.654</td>
<td>0.095</td>
<td>10.23</td>
<td>10.516</td>
<td>1.793</td>
<td>0.892</td>
</tr>
</tbody>
</table>

Means denoted within the same column with different superscripts are significantly different at P<0.05. RT: Reaction time. SV: Semen volume. MM: Mass motility. PM: Progressive motility. SL: Sperm livability. SA: Sperm abnormality. SCC: Sperm cell concentration. TSO: Total sperm output. DA: Damaged acrosome. CS: Curled spermatzoa.

Recently, Radwan et al. (2015) showed that ethanolic extracts of MO leaves possessed anti-genotoxic phytoconstituents in mice, the high percentages of micronuclei and DNA damage induced by cyclophosphamide were decreased in animals pre-dosed with the extract (Sathya et al., 2010). Many components of MO leaf extract such polyphenols and various carotenoids were observed to improve the immune system, scavenge of free radical and reduce the production of DNA mutations in different mammalian cells that were previously exposed to variety of oxidative conditions (Srinivasan et al., 2007; Devaraj et al., 2008).

Furthermore, polyphenols which are present in MO leave extract were shown in other studies to inhibit a specific protein found in bone marrow and which is responsible for cancer in bone and increased the production of antioxidants in the sperms (Abdou et al., 2012). MO was claimed to boost immune systems (Olugbemi et al., 2010).

Throughout the collection weeks, rabbit bucks in both treatment groups (G2 and G3) showed the best results concerning percentage of MM, PM, SL, SA, SCC and TSO, and the highest response to HOS-t at most collection weeks as compared to G1 (Fig. 2).

The observed impact of MO on semen characteristics may related to anti-bacterial properties of MO due to lipophilic compounds and antibiotic metabolites in MO seed extracts (Jabeen et al., 2008; Patel, 2011).

The antioxidant effect of MO leaf extract and fruit was explained by Luqman et al. (2012), who noticed that it was due to the presence of polyphenols, tannins, anthocyanin, glycosides, and thiocarbamates, which remove free radicals, activate antioxidant enzymes, and inhibit oxidases. MO leave aqueous extract was observed to have a therapeutic action through reducing of genetic alterations (micronuclei and DNA damage) in irradiated rats by gamma irradiation (Eshak and Osman, 2013).
In addition, many of micro constituents of MO leave extract were considered to be anti-carcinogenesis, they were showed in other studies to reduce the risk of ovarian cancer, lung cancer and prostate cancer in human and mice (Van Breda et al., 2005; Gitenay et al. 2007). MO has non-toxic properties as previously reported (Lawal et al., 2005).

Fig. (2): Changes in semen characteristics during successive collection weeks.

Reproductive performance of mated does:

Data presented in Table 4 revealed that rabbit does mated by bucks in G2 showed the best results regarding the reproductive performance, in terms of the highest kindling rate, total number of borns, total and live litter size at birth and viability rate at weaning, but the differences were not significant. Also, does mated by bucks in G2 showed significantly (P<0.05) the highest proportion of females, litter size at weaning, and litter weight at birth and weaning. However, rabbit does mated by bucks in G3 showed significantly (P<0.05) the highest average bunny weight at birth (g).

Table 4. Reproductive performance of rabbit does mated with bucks in the experimental groups.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Experimental group</th>
<th>±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G1 (Control)</td>
<td>G2 (60 mg/h)</td>
</tr>
<tr>
<td>Kindling rate (%)</td>
<td>66.33</td>
<td>100</td>
</tr>
<tr>
<td>Total number of borns</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td>Litter size at birth/doe</td>
<td>5.00</td>
<td>6.57</td>
</tr>
<tr>
<td>Live borns at birth/doe</td>
<td>5.00</td>
<td>6.57</td>
</tr>
<tr>
<td>Viability rate at birth (%)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Male (%)</td>
<td>54.29&lt;sup&gt;a&lt;/sup&gt;</td>
<td>23.91&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Female (%)</td>
<td>45.71&lt;sup&gt;b&lt;/sup&gt;</td>
<td>76.09&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Litter size at weaning (n)</td>
<td>3.67&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.67&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Viability rate at weaning (%)</td>
<td>75.56</td>
<td>82.5</td>
</tr>
<tr>
<td>Average bunny weight at birth (g)</td>
<td>42.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>51.9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Litter weight at birth (g)</td>
<td>213.33&lt;sup&gt;b&lt;/sup&gt;</td>
<td>346.33&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Litter weight at weaning (g)</td>
<td>1476.7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2150.0&lt;sup&gt;0&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Means denoted within the same row with different superscripts are significantly different at P<0.05.
A 20-week feeding trial was conducted by Odeyinka et al. (2008) to evaluate the reproductive performance of rabbits fed MO as a replacement for Centrosema pubescens. Freshly harvested C. pubescens and MO leaves were offered to the animals at 20% of their live weight at the ratios of 100:0 (MO), 75:25 (M25), 50:50 (M50), 25:75 (M75), and 0:100 (M100), in addition to the concentrate feed offered to the animals. There were significant differences in litter size and average daily weight gain per kid, on their live weight at the ratios of 100:0 (MO), 75:25 (M25), 50:50 (M50), 25:75 (M75), and 0:100 (M100), animals. There were significant differences in litter size in addition to the concentrate feed offered to the animals. There were significant differences in litter size at weaning, and average daily weight gain per kid, on the different treatments ($P<0.05$). However, there was no significant difference in gestation length as well as litter weight at birth. It was concluded that MO can be used to replace Centrosema pubescens without adverse effects on the reproductive performance of rabbit does.

CONCLUSION

The current findings suggested that Moringa oleifera extract at a level of 60 mg/h as oral administration for 21 days has significant value in improving the antioxidant status and could serve as a supportive treatment in the nutritional management to improve semen production of rabbit bucks, and consequently increasing reproductive performance of rabbit does mated by this semen.

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تأثير تجريد مستخلصات النبات المورينجا على صفات السائل المنوي في الأرانب

El-Harairy, M. A. et al.


تهدف هذه الدراسة إلى معرفة تأثير التجريد مستخلصات نبات المورينجا الكامل عند مستوى صفر و ٢٦٠ ملليجرام/لتر لمدة ٢١ يوم على أداء و صفات السائل المنوي لذكور الأرانب. استخدمت هذه الدراسة ١٢ ذكرًا من ذكور الأرانب البويزوالداني بمتوسط وزن ٣ كجم وعمر ٢ شهر قسمت إلى ثلاث مجموعات متماثلة (١٤) لكل مجموعة. المجموعة الأولى أُعطت ٣ مل ماء مغذٍ ومعقم (الكمي) بينما المجموعة الثانية والثالثة أعطت ٣ مل ماء مغذٍ وبحوث على التوالي من مستخلص نبات المورينجا الكامل لمدة ٢١ يوم قبل جمع السائل المنوي. كل الأرانب غذت على علبة تجارية وتحت نفس الظروف والرعاية. تم جمع السائل المنوي مرتين أسبوعيًا لمدة ٨ أسابيع. في يوم الجمع تم حساب الرغبة الجنسية وتقديم حجم القذيفة ودرجة الحموضة والحركة الجماعية والحركة الفردية ونسبة الحيوانات المتخصصة وفي السائل المنوي وتركيز الهرمونات المنوية والتركيز الكلي لكل فرد ومواد الأوروكرومو والاستجابة للاختبار الاستمراري. أظهرت النتائج التالية:

السولو (النفاذ المحمولة) عند مستوى صفر ملليجرام تصل إلى ٣٣٥ ملليجرام (النفاذ الفوضوي).

استخلص نبات المورينجا الكامل ليس له تأثير معياري على وزن الجسم الحي لذكر الأرانب. الرغبة الجنسية ونسبة الحركية الجماعية والثنائية والحادي وتركيز الهرمونات المنوية وتركيز الكلي لكل فرد ومواد الأوروكرومو والاستجابة للاختبار الاستمراري تختلف بشكل كبير بين مستخلصات المورينجا. تم قياس هذا الاختلاف في متوسط درجة الحموضة بين المجموعة الثانية والثالثة بمقابل ٠.٠٢٥ (P<0.05) لكل من المستويين من مستخلصات المورينجا. ها تم قياس هذه الاختلافات في متوسط درجة الحموضة بين المجموعة الثانية والثالثة بمقابل ٠.٠٢٥ (P<0.05) عن في المجموعة الثانية. زاد حجم القذيفة بنسبة ٢٨٪ بمقابل ٠.٠٢٥ (P<0.05) في المجموعة الثانية مما أعطت المجموعة الأولى. يتبين أن هذه المجموعة كانت غير مبنية

من حيث محتوى الهيم ونسبة الهرمونات ومواد الأوروكرومو ونسبة شواذ الإكوركرومو. كانت هذه المجموعة كانت بالفعل مبنية (P<0.05) لأنها تحققت بالفعل مبنية في جميع الخصائص المختلفة.

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الخلاصة:

تجريد مستخلصات نبات المورينجا عند مستوى ٢٦٠ ملليجرام/لتر لمدة ٢١ يوم له دور فعال في تحسين مضادات الأكسدة وبالتالي يحسن أداء سائل المنوي لذكر الأرانب وزيادة الكفاءة التناسلية لذكورها الذي تلقى هذا المستخلص.

224