

**Table: 2 .**The composition and chemical analysis of the basal experimental diet

| Ingredients         | %     | Calculated analysis              |       |                       |       |
|---------------------|-------|----------------------------------|-------|-----------------------|-------|
| Yellow corn         | 6.22  | Crude protein, %                 |       | 18.8                  |       |
| Soybean meal, 44%   | 22.33 | Crude fiber, %                   |       | 13.0                  |       |
| Wheat bran          | 23.33 | Ether extract, %                 |       | 3.0                   |       |
| Barley              | 15.00 | Digestible energy (kcal/kg diet) |       | 2680                  |       |
| Alfalfa hay         | 30.12 | n-6 poly unsaturated FAs%        |       | 0.3                   |       |
| Ground limestone    | 1.00  | n-3 poly unsaturated FAs%        |       | 1.03                  |       |
| Dicalcium Phosphate | 1.20  | Determined analysis (g/kg)       |       |                       |       |
| Common salt         | 0.50  | Dry matter                       | 897.1 | Crude fiber           | 138.5 |
| Vit. + min. premix* | 0.30  | Organic matter                   | 801.4 | Ether extract         | 26.2  |
| Total               | 100.0 | Crude protein                    | 169.8 | Nitrogen-free extract | 575.0 |
|                     |       |                                  |       | Ash                   | 87.9  |

\*Each 3 kg of premix contains: Vit. A: 12,000,000 IU; Vit. D3: 3,000,000 IU; Vit. E: 10.0 mg; Vit. K3: 3.0 mg; Vit. B1: 200 mg; Vit. B2: 5.0 mg; Vit. B6: 3.0 mg; Vit. B12: 15.0 mg; Biotin: 50.0 mg; Folic acid: 1.0 mg; Nicotinic acid: 35.0 mg; Pantothenic acid: 10.0 mg; Mn: 80 g; Cu: 8.8 g; Zn: 70 g; Fe: 35 g; I: 1 g; Co: 0.15g and Se: 0.3g.

**Table: 1:** Ambient temperature (°C), relative humidity (%), temperature humidity index (THI) and photoperiod (h) during the experiment period

| Parameters               | Mid-July        | August          | September       | Mid-October     | Overall | SEM  | P-Value |
|--------------------------|-----------------|-----------------|-----------------|-----------------|---------|------|---------|
| Ambient temperature (°C) | 31 <sup>b</sup> | 32 <sup>a</sup> | 31 <sup>b</sup> | 28 <sup>c</sup> | 30.5    | 0.4  | 0.001   |
| Relative humidity (%)    | 76 <sup>a</sup> | 73 <sup>b</sup> | 76 <sup>a</sup> | 76 <sup>a</sup> | 75.3    | 0.08 | 0.001   |
| THI                      | 29 <sup>b</sup> | 31 <sup>a</sup> | 30 <sup>b</sup> | 27 <sup>c</sup> | 29.3    | 1.2  | 0.001   |
| Photoperiod (h)          | 14              | 13              | 12              | 11              | 12.5    | 0.8  | 0.001   |

<sup>a,b,c</sup> Means within a row with different superscript letters are significantly.

THI values were then classified as follows: < 27.8 = Absence of heat stress, 27.8 to < 28.9 = Moderated heat stress, 28.9 to < 30.0 = Sever heat stress and 30 and over = Very sever heat stress (Marai *et al.* , 2001 and 2008)

**Table 3:** Effect of selenium dioxide and *Tribulus terrestris* aqueous extract and their combination on hormonal profile measured in blood plasma of Californian buck rabbits

| Parameters                      | control            | Se                | ETT1              | ETT2              | ETT1+Se           | ET<br>T2+Se       | SEM          | P-<br>Value  |
|---------------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------|--------------|
| <b>FSH(ng/ml)</b>               | 1.02 <sup>ab</sup> | 0.77 <sup>c</sup> | 1.10 <sup>a</sup> | 0.96 <sup>b</sup> | 0.44 <sup>d</sup> | 0.16 <sup>e</sup> | <b>0.021</b> | <b>0.001</b> |
| <b>LH(ng/ml)</b>                | 0.35 <sup>e</sup>  | 0.44 <sup>d</sup> | 0.79 <sup>a</sup> | 0.65 <sup>b</sup> | 0.57 <sup>c</sup> | 0.19 <sup>f</sup> | <b>0.323</b> | <b>0.001</b> |
| <b>FT(ng/ml)</b>                | 1.77 <sup>d</sup>  | 2.78 <sup>c</sup> | 4.99 <sup>a</sup> | 3.64 <sup>b</sup> | 2.87 <sup>c</sup> | 3.77 <sup>b</sup> | <b>0.532</b> | <b>0.001</b> |
| <b>P<sub>4</sub> (ng/ml)</b>    | 0.09 <sup>c</sup>  | 0.13 <sup>c</sup> | 0.24 <sup>b</sup> | 0.35 <sup>a</sup> | 0.27 <sup>b</sup> | 0.11 <sup>c</sup> | <b>0.053</b> | <b>0.001</b> |
| <b>E<sub>2</sub>17β (pg/ml)</b> | 22.9 <sup>b</sup>  | 28.3 <sup>a</sup> | 29.9 <sup>a</sup> | 16.6 <sup>c</sup> | 23.8 <sup>b</sup> | 17.7 <sup>c</sup> | <b>1.235</b> | <b>0.001</b> |

\*Means ± Standard error which superscripts with different small letters (a-c) within the same row differ significantly at P<0.05 Se: 0.4mg/litter water Selenium dioxide, ETT1: Aqueous extract *TribulusTerrestris* 50mg/kg BW, ETT2: Aqueous extract *TribulusTerrestris* 100 mg/kg BW. ETT1+Se= Aqueous extract *TribulusTerrestris* 50 mg/kg BW+ 0.4mg/litter water Selenium dioxide. ETT+Se= Aqueous extract *TribulusTerrestris* 100 mg/kg BW+Se0.4mg/litter water Selenium dioxide. FSH: follicle stimulating hormone, LH: luteinizing hormone, FT: FreeTestosterone, P<sub>4</sub>: Progesterone, E<sub>2</sub>17β: Estrogen.

**Table 4:** Effect of Selenium dioxide and *Tribulus Terrestris* aqueous extract and their combination on biochemical parameters measured in the blood plasma of Californian buck rabbits

| Parameters  | Control | Se   | ETT1 | ETT2 | ETT1<br>+Se | ETT2<br>+Se | SEM           | P-Value      |
|-------------|---------|------|------|------|-------------|-------------|---------------|--------------|
| TP (g/dl)   | 7.39    | 7.44 | 7.19 | 7.26 | 7.37        | 7.26        | <b>0.123</b>  | <b>0.056</b> |
| Alb(g/dl)   | 4.43    | 4.30 | 4.06 | 4.27 | 4.36        | 4.03        | <b>0.130</b>  | <b>0.085</b> |
| Glb(g/dl)   | 2.96    | 3.09 | 3.13 | 2.99 | 2.89        | 3.03        | <b>0.155</b>  | <b>0.085</b> |
| AST (U/l)   | 25.0    | 24.7 | 26.0 | 24.9 | 27.2        | 25.5        | <b>0.625</b>  | <b>0.452</b> |
| ALT(U/l)    | 32.3    | 30.7 | 28.7 | 27.3 | 30.4        | 32.7        | <b>0.845</b>  | <b>0.541</b> |
| ALP (U/l)   | 171     | 161  | 174  | 171  | 166         | 173         | <b>4.054</b>  | <b>0.689</b> |
| Cre (mg/dl) | 0.99    | 1.07 | 1.10 | 1.08 | 0.96        | 0.98        | <b>0.235</b>  | <b>0.066</b> |
| TAC(mg/dL)  | 114     | 122  | 112  | 118  | 122         | 108         | <b>6.541</b>  | <b>0.942</b> |
| HDL(mg/dL)  | 12.9    | 12.5 | 12.6 | 11.9 | 12.1        | 12.8        | <b>0.691</b>  | <b>0.653</b> |
| LDL(mg/dL)  | 88.8    | 89.9 | 90.3 | 88.6 | 89.1        | 94.4        | <b>2.659</b>  | <b>0.084</b> |
| TG(mg/dL)   | 123     | 122  | 124  | 116  | 121         | 127         | <b>5.46</b>   | <b>0.562</b> |
| T L(mg/dl)  | 321     | 288  | 290  | 289  | 287         | 288         | <b>12.561</b> | <b>0.452</b> |

\*Means  $\pm$  Standard error which superscripts with different small letters (a-c) within the same row differ significantly at  $P < 0.05$ . Se: 0.4mg/litter water Selenium dioxide, ETT1: Aqueous extract *TribulusTerrestris* 50mg/kg BW, ETT2: Aqueous extract *TribulusTerrestris* 100 mg/kg BW. ETT1+Se= Aqueous extract *TribulusTerrestris* 50 mg/kg BW+ 0.4mg/litter water Selenium dioxide. ETT+Se= Aqueous extract *TribulusTerrestris* 100 mg/kg BW+Se0.4mg/litter water Selenium dioxide. TP: Total protein, ALb: Albumin, GLb: Globulin, ALP: Alkalinephosphatase, AST: aspartate aminotransferase, ALT: alanine aminotransferase, Cre: Creatinine, TAC: Total cholesterol, LDL: low density lipoprotein, HDL: High density, lipoprotein, TG: triglyceride, TL: Total lipid.

**Table 5:** Effect of Selenium dioxide and *Tribulus Terrestris* aqueous extract and their combination on antioxidant and immunoglobulin status measured in the blood plasma of Californian buck rabbits

| Parameters          | Control           | Se                | ETT1              | ETT2              | ETT1+Se           | ETT2+Se           | SEM          | P Value       |
|---------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------|---------------|
| <b>TAC(nmol/ml)</b> | 2.04              | 2.49              | 2.17              | 2.55              | 2.38              | 2.82              | <b>0.104</b> | <b>0.424</b>  |
| <b>MAD(nmol/ml)</b> | 2.27              | 1.97              | 1.69              | 1.97              | 1.88              | 1.76              | <b>0.062</b> | <b>0.0558</b> |
| <b>IgG, (mg/dl)</b> | 23.66             | 26.2              | 27.67             | 28.63             | 31.33             | 33.37             | <b>1.567</b> | <b>0.2898</b> |
| <b>IgM, (mg/dl)</b> | 3.62 <sup>b</sup> | 4.23 <sup>b</sup> | 4.58 <sup>b</sup> | 4.55 <sup>b</sup> | 5.51 <sup>a</sup> | 5.65 <sup>a</sup> | <b>0.550</b> | <b>0.0013</b> |

\*Means  $\pm$  Standard error which superscripts with different small letters (a-c) within the same row differ significantly at  $P < 0.05$ . Se: 0.4mg/litter water Selenium dioxide, ETT1: Aqueous extract *Tribulus Terrestris* 50mg/kg BW, ETT2: Aqueous extract *Tribulus Terrestris* 100 mg/kg BW. ETT1+Se= Aqueous extract *Tribulus Terrestris* 50 mg/kg BW+ 0.4mg/litter water Selenium dioxide. ETT+Se= Aqueous extract *Tribulus Terrestris* 100 mg/kg BW+Se0.4mg/litter water Selenium dioxide.

TAC: Total antioxidant capacity, MAD: Malonyelaldehyed ,IgG: Immunoglobulin G, IgM: Immunoglobulin M.

**Table 6:** Effect of Selenium dioxide and *Tribulus Terrestris* aqueous extract and their combination on body weight feed intake and feed conversion ratio in the blood plasma of Californian buck rabbits

| Parameters    | Control           | Se                | ETT1              | ETT2              | ETT1<br>+Se       | ETT2<br>+Se       | SEM   | P Value |
|---------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------|---------|
| Initial BW, g | 2150              | 2157              | 2159              | 2153              | 2249              | 2158              | 18.37 | 0.9998  |
| Final BW, g   | 3083 <sup>c</sup> | 3220 <sup>c</sup> | 3384 <sup>a</sup> | 3421 <sup>a</sup> | 3442 <sup>a</sup> | 3428 <sup>a</sup> | 29.37 | 0.0038  |
| BWG, g        | 933 <sup>c</sup>  | 1062 <sup>c</sup> | 1225 <sup>a</sup> | 1260 <sup>a</sup> | 1293 <sup>a</sup> | 1260 <sup>a</sup> | 31.63 | 0.0072  |
| FI, g/ buck   | 5841              | 5111              | 5361              | 5434              | 5562              | 5466              | 92.95 | 0.1643  |
| FCR ratio     | 6.32 <sup>a</sup> | 4.81 <sup>b</sup> | 4.39 <sup>b</sup> | 4.32 <sup>b</sup> | 4.34 <sup>b</sup> | 4.35 <sup>b</sup> | 0.168 | 0.0056  |

\* Means ± Standard error which superscripts with different small letters (a-c) within the same row differ significantly at P<0.05. Se: 0.4mg/litter water Selenium dioxide, ETT1: Aqueous *extract TribulusTerrestris* 50mg/kg BW, ETT2: Aqueous *extract TribulusTerrestris* 100 mg/kg BW. ETT1+Se= Aqueous *extract TribulusTerrestris* 50 mg/kg BW+ 0.4mg/litter water Selenium dioxide. ETT+Se= Aqueous *extract TribulusTerrestris* 100 mg/kg BW+Se0.4mg/litter water Selenium dioxide.

**Table 7.** Effect of Selenium dioxide and *Tribulus Terrestris* aqueous extract and their combination on semen quality and reproductive performance of Californian buck rabbits

| Parameters                   | Control           | Se                 | ETT1               | ETT2               | ETT1+Se           | ETT2+Se           | SEM    | P Value |
|------------------------------|-------------------|--------------------|--------------------|--------------------|-------------------|-------------------|--------|---------|
| RT (Sec)                     | 6.21 <sup>a</sup> | 4.05 <sup>b</sup>  | 3.98 <sup>b</sup>  | 3.21 <sup>b</sup>  | 3.00              | 2.98 <sup>c</sup> | 0.235  | 0.001   |
| Ej.(ml)                      | 0.43 <sup>d</sup> | 0.79 <sup>ab</sup> | 0.82 <sup>b</sup>  | 0.71 <sup>b</sup>  | 0.85 <sup>a</sup> | 0.83 <sup>a</sup> | 0.084  | 0.001   |
| AdM %                        | 62.2 <sup>c</sup> | 78.4 <sup>a</sup>  | 76.3 <sup>a</sup>  | 71.3 <sup>b</sup>  | 79.4 <sup>a</sup> | 78.4 <sup>a</sup> | 1.365  | 0.001   |
| Sperm conc. x10 <sup>6</sup> | 180 <sup>c</sup>  | 287 <sup>ab</sup>  | 298 <sup>a</sup>   | 278                | 300 <sup>a</sup>  | 285 <sup>ab</sup> | 25.233 | 0.001   |
| SAb %                        | 17.8 <sup>a</sup> | 12.8 <sup>b</sup>  | 13.0 <sup>b</sup>  | 14.2 <sup>c</sup>  | 11.9 <sup>c</sup> | 12.1 <sup>c</sup> | 1.254  | 0.001   |
| Dead sperm %                 | 24.1 <sup>a</sup> | 15.9 <sup>b</sup>  | 16.3 <sup>cb</sup> | 15.8 <sup>cb</sup> | 13.6 <sup>c</sup> | 13.3 <sup>c</sup> | 3.182  | 0.001   |
| Cell integrity %             | 50.2 <sup>c</sup> | 73.3 <sup>b</sup>  | 74.1 <sup>b</sup>  | 73.5 <sup>b</sup>  | 78.9 <sup>a</sup> | 81.3 <sup>a</sup> | 6.241  | 0.001   |
| Fertility rate %             | 55.2 <sup>d</sup> | 72.3 <sup>c</sup>  | 76.2 <sup>b</sup>  | 77.8 <sup>b</sup>  | 81.1 <sup>a</sup> | 81.5 <sup>a</sup> | 4.56   | 0.001   |
| L.S.B, n                     | 5.6 <sup>c</sup>  | 7.1 <sup>b</sup>   | 7.5 <sup>b</sup>   | 8.2 <sup>a</sup>   | 8.4 <sup>a</sup>  | 9.1 <sup>a</sup>  | 0.361  | 0.001   |

\*Means ± Standard error which superscripts with different small letters (a-c) within the same row differ significantly at P<0.05.

Se: 0.4mg/litter water Selenium dioxide, ETT1: Aqueous *extract TribulusTerrestris* 50mg/kg BW, ETT2: Aqueous *extract TribulusTerrestris* 100 mg/kg BW. ETT1+Se= Aqueous *extract TribulusTerrestris* 50 mg/kg BW+ 0.4mg/litter water Selenium dioxide. ETT+Se= Aqueous *extract TribulusTerrestris* 100 mg/kg BW+Se0.4mg/litter water Selenium dioxide. RT: Reaction time, EjV: Ejaculate volume ,AdM: advanced motility ,SAb. sperm: abnormal sperm ,L.S.B: litter size at birth .