STUDIES OF THE EFFECTS OF NIGELLA SATIVA SEEDS ON SOME HORMONES AND SOME HEMATOLOGICAL & BIOCHEMICAL PARAMETERS IN MALE RABBITS.

By

*** Shahira H. M. Hussein, ** Ibtisam M.G. El-din and * Shadia A. Refaat**
** Department of Biochemistry and **pathology & clinical pathology*
Animal Health Res. Inst. (Zagazig provinicial lab. Egypt)

SUMMARY

The experiment was designed to study the effect of feeding diets containing Nigella sativa seeds (black seeds or barka seeds) on some hormones (T3, T4 and testosterone), hematological parameters (RBCs & WBCs Counts, Hb concentration and P.C.V) and some biochemical parameters (Total proteins , albumin ,globulin, Cholesterol, glucose, ALT, AST and Alk.phosph.) in adult buscate bucks.

Seventy – five buscate bucks , 6 months old and 2-2.5 k.g body wt were used and divided into five, equal groups, 15 in each. First group served as a control group fed commercial ration free from any additives. Second, third, fourth and fifth groups were fed commercial ration containing 0.5, 1.5, 2.5 and 3.5% of freshly, crushed Nigella sativa seeds respectively for 60 successive days. At the end of feeding period (60 days) each group was further subdivided into three subgroups(5 bucks each). Blood samples were taken from each of these subgroups after one day (1st subgroup), ten days(2nd subgroup), and twenty days (3rd subgroup), respectively.

Two blood samples were taken at each time of sampling. The first was used for hematological examination and the second for hormonal and biochemical measurements.

The results of this study in the 3rd and 4th groups that fed ration containing 1.5 and 2.5% Nigella sativa seeds showed that RBCs & WBCs counts, Hb concentration and P.C.V were increased significantly $P<0.05$. Also T3, T4 & testosterone hormones, Total proteins, albumin, globulin, glucose, AST and ALT were increased significantly $P<0.05$.. While the cholesterol level in the same groups were significantly decreased $P<0.05$ as compared with the control group at one and ten days post stopping addition of seeds.

No significant changes occurred in all previous parameters after twenty days from stopping addition of the seed in all studied groups. In the second and fifth groups (0.5 and

3.5%) no significant change occurred in all duration compared with the control group.

It is concluded from the study that addition of Nigella sativa seeds to bucks ration with concentrations of 1.5 and 2.5% increase T3, T4, testosterone hormones and blood parameters beside increasing globulin levels that indicate its immunostimulant effect. Care must be taken during the use of low or high concentrations of such seed (0.5 and 3.5%) as they may have not beneficial effect with 0.5 % or may have deleterious effect with 3.5 %.

INTRODUCTION

The misuse of drugs had many toxic effects on both human and animal health that stimulates the world toward the use of medical plants for prophylaxis and treatment of many diseases. From these medical plants Nigella sativa is commonly known as black seed (barka) . It belongs to botanical family of Ronunculacor, that have the ability to increase the immunity and maintain a good health condition *(Abd-El Aoi and Attia, 1993)*. These seeds contain from 30 – 35% its weight oil that is rich in oleic and linoleic *acids (Ustunm et al., 1990).* Other workers isolated some active materials as nigellone, thymoquinone and thymohydroquinone *(Mahfouz and El-Dakhakhny 1960; El – Dakhakhny 1963 and El-Alfy et al.,1975).*

It was found that the seeds posses antimicrobial, antihelmintic, insecticidal, hypotensive, immunostimulant and increased male *fertility (Farida and Khalid 1987; Akhtar and Javed 1991; Hanafy and Hatem 1991; Salomi et al., 1992; Aquel, 1993; Azza et al, 2001 and Moussa et al, 2003).*

The present work was designed to investigate the effect of Nigella sativa seeds on blood picture, some hormonal and biochemical parameters in male rabbits.

MATERIALS AND METHODS

Materials

- Animals

75 buscate bucks of 6 months age and 2-2.5kg b.wt were used in this investigation. Rabbits were kept under hygienic conditions and fed on balanced commercial pellets. They were randomly divided into five groups 15 bucks in each. Each group was divided into 3 equal subgroups,5 buck. First group was fed

commercial pellets without additives and served as control, while second, third, fourth and fifth groups were fed commercial pellets with addition of freshly crushed Nigella sativa seeds by 0.5, 1.5, 2.5 and 3.5%(enriched ration) to each group respectively for 60 successive days.

Methods:

- Sampling

Blood samples were taken from ear vein from each of five bucks of each sub group after one, ten and twenty days from stopping addition of black seeds (enriched ration).

1st sample was collected in heparinized tube for estimation of RBCs&, WBCs counts, hemoglobin concentration and packed cell volume (P.C.V.) according to *Coles (1986).* Second sample was collected in a plain centrifuge tube to obtain clear serum for determination of triiodo thyronine (T3) and Thyroxin (T4) according to *Abraham, (1981),The* ratio of T3/T4 was calculated. Testosterone hormone was estimated according to *Ismail, (1986)* using radioimmuno assay kits (R.I.A).

Serum total proteins, and albumin were estimated according to *Doumas, (1975) and Doumas et al, (1971)* and globulin was calculated. Serum glucose was determined by *Trinder, (1969),* serum cholesterol using the method of *Watson, (1961).* Serum aspartate and alanine aminotransferase activities (AST & ALT) were estimated according to *Reitman and Frankel (1957)* and alkaline phosphatase (ALP.) according to *Kilehling and Freiburg (1951).*

The data obtained were statistically analyzed using students (T) test according to *Snedecor and Cochran (1980).*

RESULTS AND DISCUSSION

Recently much attention is directed towards the use of natural products from plant origin as Nigella sativa (black seed or barka) as feed additives to control and treat many diseases which proved to be immunostimulant *(El-sayed and El-Hashem, 2000).* It is used in veterinary practice for control of worms in some animals *(Agarwal et al; 1979 and Korshom et al; 1998),* for improvement of egg production, increase egg weight and egg hatchability in addition to increased male fertility in chickens *(Khodary et al, 1996).*

The 3rd and 4th group N.S. in conc.(1.5 and 2.5%), showed a significant increase $P< 0.05$ in RBCs and WBCs counts, Hb

concentration and packed cell volume, at the 1st and 10th days after stopping enriched ration administration. While in the 2nd and 5th groups (0.5 and 3.5% of N.S) there was no significant changes in these parameters compared to the control group (tables 1&2). All groups at twenty days after stopping enriched ration administration showed non significant change in the above parameters (table 3).

The increase in the hemogram may be due to the direct stimulatory effect of Nigella sativa on the hemopoietic tissue *(Khodary et al; 1996).* The same results were reported by *Satish et al; (1991),* who reported that Nigella sativa seeds prevented the decrease in total leukocytic count and hemoglobin concentration caused by Cisplatin.

In the 3rd and 4th group after one and ten days from stopping addition of seeds (conc. 1.5 and 2.5% respectively), there was a significant increase in T3, T4 and testosterone hormones. The ratio of T3/T4 did not show any significant change compared to control group. In 2nd, 5th groups (conc. 0.5 and 3.5%) of N.S showed non significant changes compared to the control groups (Table 4& 5). Twenty days after stopping enriched ration administration there was no significant change in the above parameters in all groups (table 6).

The increase in the levels of T3 and T4 may be attributed to the direct stimulatory effect on thyroid gland and/or indirectly through pituitary gland which increase thyroid stimulating hormone (T.S.H.) which led to increase T3 and T4 *(Merty et al; 1994 and Youssef et al; 1998).* Similar results were observed by *Khodary et al, (1996)* in laying hens, *Daghash et al, (1999)* in rabbits and in quills *Moussa et al, (2003).*

The increase in testosterone hormone may be due to the direct action of the seeds on sex hormones which increases male fertility as has been reported by *Khodary et al; (1996).* Similar results were also reported by *Moussa et al;(2003)* in quills.

Proteinogram in the 3rd and 4th group showed a significant increase in total protein, albumin and globulin after one and ten days post stopping addition of the enriched ration compared to the control groups. But in the 2nd and 5th groups there was no effect compared to the control group (table 7, 8). Twenty days after stopping enriched ration administration did not show significant change in the above parameters in all groups (table 9). The increase of total protein & albumin may be due to the high concentration of crude protein (20.5%) and free amino acids in the Nigella sativa. Similar results were observed by *Babayan et al;(*

1987), Naser et al; (1996) and *Moussa et al; (2003)*. The results of this study can be confirmed as reports of *Smith et al; (1983) and Afifi & Daghash (1999)* who found that the Nigella sativa seeds stimulate thyroid hormones which accordingly accelerate cellular reaction in most organs of the body including the liver in which the proteins are formed.

The increase in globulin levels may be related to immunostimulant effect of Nigella sativa as mentioned by *Aquel, (1993), Madbouly et al; (1999)* and *El-Sayed and El-Hashem, (2000)* in chickens.

Serum cholesterol was significantly decreased P< 0.01 in rabbits in the 3rd and 4th group fed Nigella sativa seeds (in conc.1.5 and 2.5%) at one and ten days post-stopping addition of the seed. But in the 2nd and 5th groups (0.5 and 3.5 %) there was no marked changes compared to the control group (Tables 7& 8). Twenty days after stopping enriched ration administration exhibited no effects on serum cholesterol in all groups (table 9).

The low cholesterol levels may be attributed to the presence of high content of unsaturated fatty acids in Nigella sativa seeds which may stimulate cholesterol excretion into intestine and its oxidation to bile acids as reported by *Edward (1976)*. This effect may be also due to the increase of T3 and T4 which increase cholesterol metabolism by the liver *(kaneko, 1989)*. Similar results were obtained by *Ghazalah and Ibrahim, (1996)* in ducks and *El-Ghamry et al, (1997)* in hens.

The glucose level was increased significantly P< 0.05 in the 3rd and 4th group after one and ten days from stopping addition of the seed compared to the control group. While in the 2nd and 5th groups there was no effects (Table 7 & 8). Twenty days after stopping enriched ration administration there was no significant change in the above parameters in all groups compared to the control group. (Table 9).

The increased glucose levels may be due to the stimulatory effect of these seeds on thyroid gland which increase the gluconeogensis *(Cole et al, 1994)*. The same results were previously reported by *Daghash et al; (1999)* who stated that the higher contents of energy and protein of N.S seeds may be another reasons for increasing glucose level in treated rabbits.

The level of transferase enzymes (AST & ALT) were increased significantly in the 3rd and 4th groups after one and ten days from stopping addition of the seed. While the 2nd and 5th

groups showed no changes compared to the control group (Tables 7& 8). Twenty days after stopping enriched ration administration had no significant effect on the transferase enzymes in all groups (Table 9).

Alkaline phosphatase enzyme showed no significant change compared to the control groups in all groups at all durations (Tables 7, 8 & 9).

The increase in transferase enzymes in this study may be a result of high thyroid hormones secretion *(Lee and Knowles, 1965)* and attributed to the increase in gluconeogenesis as the ALT and AST play an important role in this processes as has been previously reported by *Olbrich et al (1972)* and *Davidson (1994).* The present study was in agreement with those reported by *Daghash et al, (1999)* and *Maysa et al, (2000).*

CONCLUSION

Nigella sativa seeds which are a cheap local plant can be added to the commercial pellets of rabbits in concentrations of 1.5 to 2.5% to improve general health condition of rabbits as they improve hemogram, improve male fertility through increasing male sex hormone (testosterone) and decrease cholesterol level. It must be noticed that the proper doses are mandatory to obtain proper results as high or low levels may have no effect or even adverse effects.

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Table (1): blood picture (mean value ± S.E) at one day, post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0.5% of N.S	3rd group 1.5% N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
RBCs x 10^6/ ul	6.8 ± 0.32	7.2 ± 0.18	8.0 ± 0.31*	7.8 ± 0.21*	6.6 ± 0.23
WBCs x 10^3/ ul	7.3 ± 0.21	7.8 ± 0.30	8.8 ± 0.27**	7.9 ± 0.18*	7.4 ± 0.24
Hb gm/ dl	13.2 ± 0.16	13.2 ± 0.13	13.8 ± 0.06*	13.6 ± 0.04*	13.2 ± 0.09
P.C.V %	39.4 ± 0.81	41.2 ± 0.49	43 ± 1.14*	42.2 ± 0.66*	38.1 ± 1.32

Table (2): blood picture(mean value ± S.E) at ten days post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0.5% of N.S	3rd group 1.5% N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
RBCs x 10^6 ul	6.1 ± 0.21	6.6 ± 0.28	7.6 ± 0.14*	7.0 ± 0.09*	6.2 ± 0.11
WBCs x 10^3 ul	6.7 ± 0.22	7.1 ± 0.11	8.0 ± 0.32*	7.4 ± 0.21*	6.8 ± 0.33
Hb gm/ dl	13.1 ± 0.11	13.7 ± 0.16	14.01 ± 0. 2*	13.9 ± 0.11*	13.1 ± 0.25
P.C.V %	40.8 ± 0.79	41.0 ± 0.13	41.6 ± 0.27	41.1 ± 0.15*	40.2 ± 0.31

Table (3): Blood picture (mean value ± S.E) 20 days post stopping enriched ration to male rabbits (n = 5).

Parameters	Control group	2nd group 0.5% of N.S	3rd group 1.5% N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
RBCs x 10^6 ul	6.0 ± 0.08	5.8 ± 0.18	6.4 ± 0.2	6.3 ± 0.34	5.7 ± 0.42
WBCs x 10^3 ul	6.8 ± 0.17	6.4 ± 0.27	7.0 ± 0.12	6.9 ± 0.17	6.6 ± 0.21
Hb gm/ dl	13.6 ± 0.12	13.8 ± 0.19	13.8 ± 0.16	13.7 ± 0.22	13.4 ± 0.27
P.C.V %	38.2 ± 0.71	38.6 ± 0.29	39.2 ± 0.59	38.2 ± 0.2	38.1 ± 0.29

Table (4): Hormonal changes (mean value ± S.E) one day post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0.5% of N.S	3rd group 1.5% of N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
T3 ng/dl	1.03 ± 0.09	1.32 ± 0.11	2.48 ± 0.23*	1.83 ± 0.12*	0.97 ± 0.07
T4 ng/dl	2.99 ± 0.13	3.45 ± 0.16	5.68 ± 0.16*	4.57 ± 0.13*	3.32 ± 0.15
T3 / T4 ratio	0.34 ± 0.04	0.38 ± 0.02	0.44 ± 0.04*	0.40 ± 0.03	0.29 ± 0.02
Testosterone ng/ dl	3.38 ± 0.17	3.42 ± 0.2	4.88 ± 0.11*	4.24 ± 0.6*	3.18 ± 0.31

Table (5): Hormonal changes (mean value ± S.E) ten days post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0.5% of N.S	3rd group 1.5% N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
T3 ng/dl	1.22 ±0.5	1.26 ± 0.07	1.96 ± 0.09*	1.46 ± 0.07*	1.20 ± 0.07
T4 ng/dl	2.78 ± 0.04	3.08 ± 0.13	4.31 ± 0.18*	3.98 ± 0.14*	3.04 ± 0.11
T3 / T4 ratio	0.44 ± 0.02	0.42 ± 0.02	0.45 ± 0.04	0.37 ± 0.03	0.40 ± 0.03
Testosterone ng/ dl	3.21 ± 0.16	3.29 ± 0.12	4.06 ± 0.09*	3.95 ± 0.12*	3.12 ± 0.06

* Significant at (P < 0.05) ** Significant at (P < 0.01)

Table (6): Hormonal changes (mean value ± S.E) at twenty days post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0.5% of N.S	3rd group 1.5% N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
T3 ng/dl	1.1 ± 0.03	1.2 ± 0.06	1.24 ± 0.08	1.4 ± 0.09	1.06 ± 0.05
T4 ng/dl	2.73 ± 0.09	2.96 ± 0.09	2.94 ± 0.08	2.92 ± 0.07	2.82 ± 0.06
T3 / T4 ratio	0.40 ± 0.04	0.41 ± 0.007	0.43 ± 0.05	0.48 ± 0.02	0.38 ± 0.03
Testosterone ng/ dl	3.29 ± 0.08	3.38 ± 0.10	3.46 ± 0.15	3.44 ± 0.13	3.24 ± 0.09

Table (7): Biochemical changes (mean values ± S.E) one day post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0.5% of N.S	3rd group 1.5% 0f N.S	4th group 2.5% of N.S	5th group 3.5% of N.
T.P gm/dl	6.8 ± 0.11	7.99 ± 0.21*	8.84 ± 0.8**	8.2 ± 0.26*	6.44 ± 0.29
Albumin gm/ dl	4.0 ± 0.12	4.16 ± 0.10	5.2 ± 0.08*	4.99±0.15*	3.44 ± 0.18
Globulin gm/ dl	2.8 ± 0.16	3.83 ± 0.24	3.68 ± 0.02**	3.21 ± 0.02*	3.0 ± 0.15
Cholesterol mg/ dl	87.19 ± 2.31	84.34 ± 2.89	70.04 ± 2.70*	76.08 ± 2.96*	85.0 ± 3.12
Glucose mg/ dl	91.62 ± 2.61	93.70 ± 2.75	108.95 ± 1.81*	102.09 ± 1.42*	92.60 ± 2.0
AST u/ml	36.24 ± 2.24	40.48 ± 1.98	48.32 ± 1.11*	46.11 ± 2.93*	38.12 ± 1.8
ALT u/ml	40.43 ± 1.62	42.48 ± 1.35	49.8 ± 1.64*	46.35 ± 2.78*	39.36 ± 1.6
Alk phosph n mol/L	15.42 ± 1.30	15.29 ± 1.49	15.47 ± 1.73	15.88 ± 0.1	14.06 ± 1.3

Table (8): Biochemical changes (mean value ± S.E) ten days post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0,5% of N.S	3rd group 1.5% 0f N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
T.P gm/dl	6.4 ± 0.31	6.28 ± 0.27	8.4 ± 0.28*	7.88 ± 0.17*	6.25 ± 0.21
Albumtin gm/ dl	3.3 ± 0.25	3.18 ± 0.39	4.58 ± 0.32*	4.35 ± 0.38*	3.88 ± 0.15
Globulin gm/ dl	3.1 ± 0.32	3.10 ± 0.10	3.82±0.07*	3.53 ± 0.09*	2.37 ± 0.16
Cholesterol mg/dl	88.79 ± 2.94	79.46 ± 3.07	74.04 ± 2.57*	72.68 ± 2.01*	86.21 ± 1.71
Glucose mg/ dl	89.32 ± 2.07	94.20 ± 1.86	103.56 ± 2.13*	99.71 ± 1.73*	91.06 ± 1.75
AST u/ml	35.51 ± 1.36	34.9 ±0.89	45.2 ± 1.26*	42.40 ± 1.02*	34.70 ± 1.73
ALT u/ml	41.15 ± 1.93	41.9 ± 2.05	47.16 ± 1.32*	45.70 ± 1.81*	41.07 ± 1.79
Alk phosph. n mol/L	14.19 ± 0.83	16.20 ± 1.91	16.7 ± 1.32	15.92 ± 0.92	14.56 ± 1.75

Table (9): Biochemical changes (mean value ± S.E) twenty day post stopping enriched ration to male rabbits (n = 5).

Parameters	control group	2nd group 0.5% of N.S	3rd group 1.5% of N.S	4th group 2.5% of N.S	5th group 3.5% of N.S
T.P gm/dl	6.88 ± 0.31	6.75 ± 0.32	6.48 ± 0.28	6.34 ± 0.37	7.02 ± 0.34
Albumin gm/ dl	3.78 ± 0.30	3.50 ± 0.33	3.48 ± 0.21	3.92 ± 0.19	3.92 ± 0.19
Globulin gm/ dl	3.1 ± 0.13	3.25 ± 0.06	3.0 ± 0.12	2.42 ± 0.20	3.1 ± 0.20
Cholesterol mg/ dl	89.74 ± 1.69	86.62 ± 2.89	87.98 ± 1.68	86.64 ± 2.73	87.16 ± 3.65
Glucose mg/ dl	90.46 ± 2.36	91.11 ± 1.53	89.20 ± 1.79	90.20 ± 1.07	90.13 ± 1.95
AST u/ml	36.09 ± 1.08	35.78 ± 1.12	35.95 ± 1.27	34.20 ± 1.96	34.76 ± 1.49
ALT u/ml	41.22 ± 1.30	40.17 ± 1.36	41.90 ± 0.96	39.6 ± 1.35	39.21 ± 0.86
Alk phosph. n mol/L	14.91 ± 1.06	15.1 ± 0.96	15.76 ± 1.07	15.43 ± 0.69	14.93 ± 0.86

* Significant at ($P < 0.05$) ** Significant at ($P < 0.01$)

الملخص العربي

دراسة تأثير حبة البركة على صورة الدم وبعض الهرمونات والوظائف البيوكيميائية في ذكور الأرانب

*شهيرة حنفي محمود حسين ــ ** ابتسام محمد جمال الدين -* شاديه احمد رفعت

*قسم الكيمياء والنقص الغذائي والسموم ــ**قسم الباثولوجيا والباثولوجيا الاكلينيكيه

معهد بحوث صحة الحيوان (فرع الزقازيق)

صمم هذا البحث لدراسة تأثير إضافة مسحوق حبة البركة بتركيزات مختلفة على صورة الدم وبعض الهرمونات و ا لوظائف البيوكيميائية في الأرانب وذلك لأهمية الحبة السوداء في الوقاية وعلاج العديد من الأمراض.

وقد تم استخدام 75 أرنباً بوسكت في هذه الدراسة من مزرعة أرانب خاصة بمحافظة الشرقية يبلغ عمر الأرانب 6 شهور ووزنها 2 – 2.5 كجم حيث تم تقسيم هذه الأرانب إلى خمس مجموعات متساوية يضم كلاً منها 15 أرنب. المجموعة الأولى ضابطة لم يضاف إلى العليقة المستخدمة في تغذيتها أي شيء والمجموعة الثانية والثالثة والرابعة والخامسة ثم إضافة مجروش حبة البركة المحضرة حديثاً إلى عليقاتها بتركيزات 0.5 ، 1.5، 2.5، 3.5% على التوالي لمدة 60 يوم على التوالى ثم قسمت كل مجموعه إلى ثلاث مجموعات أخرى اصغر منها يحتوى كل منها على خمس أرانب بعد انتهاء فترة الشهرين حيث ثم أخذ عينتي دم من كل أرنب من الخمسة(المكونة للثلاث مجموعات) في ثلاث فترات هي (. المجموعة الأولى) بعد يوم من توقف إضافة حبة البركة إلى العليقة و(المجموعة الثانية) بعد عشرة أيام من توقف إضافة حبة البركة إلى العليقة و(المجموعة الثالثة) بعد عشرين يوما من توقف إضافة حبة البركة إلى العليقة و قد تم إضافة العينة الأولى للهيبارين لدراسة تأثير حبة البركة على صورة الدم . ثم أخذت العينة الثانية لفصل المصل لقياس هرمونات الغدة الدرقية (الترای ايودو ثيرونين والثيروكسين) وهرمون الذكورة (التستوستيرون) وبعض القياسات البيوكيميائية.

أشارت النتائج إلى زيادة هرمونات الغدة الدرقية وهرمون التستوسيترون وكذلك زيادة معنوية فى العدد الكلى لكرات الدم الحمراء و البيضاء، بالإضافة إلي الهيموجلوبين

وحجم خلايا الدم المرصوصة بعد 1، 10 أيام من توقف إضافة حبة البركة بتركيزات 1.5 ، 2.5% مقارنة بالمجموعة الضابطة.

وبدراسة تأثير حبة البركة على الوظائف البيوكيميائية أشارت النتائج إلى زيادة معنوية فى البروتين الكلى، والألبومين والجلوبيولين والجلوكوز وأنزيم الألانين والاسبرتيت امينو ترانس فيرز بعد اليوم الأول والعاشر من توقف إضافة حبة البركة بتركيزات 1.5 ، 2.5% مقارنة بالمجموعة الضابطة. ولكن نفس النسب من حبة البركة أدت إلى نقص معنوى فى الكوليسترول عند نفس المدة بينما لم يتأثر الفوسفاتيز القلوي تأثيراً معنوياً.

وقد وجد أن كل القياسات السابقة بعد اليوم الأول والعاشر من توقف إضافة حبة البركة بتركيزات0.5, 3.5% لم تتأثر تأثيرا معنوياً مقارنة بالمجموعة الضابطة . و بعد 20 يوم من توقف إضافة حبة البركة إلى العليقة لوحظ أن كل القياسات السابقة في كل المجموعات لم تتغير معنويا مقارنة بالمجموعة الضابطة.

من هنا يتضح أن إضافة حبة البركة إلى عليقة الأرانب أدت إلى تحسن واضح في الحالة الصحية العامة للأرانب وذلك نتيجة زيادة هيموجلوبين الدم و هرمونات الغدة الدرقية وهرمون الذكورة الذي يؤدى إلى تحسن الخصوبة لدى الذكور بالإضافة إلى زيادة نسبة الجلوبيولين في الدم والمسئول عن نشاط الجهاز المناعي ولذا ننصح باستخدام الجرعات المناسبة وهى 1.5 ، 2.5% أما الجرعة الصغيرة وكذلك الكبيرة (0.5 ، 3.5%) فليس لها تأثير مفيد بل من الممكن أن يكون لها تأثير عكسى.

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