

EFFECT OF INCORPORATION OF *MALVA SYLVESTRIS* POWDER IN RABBIT DIETS ON ZOOTECHNICAL AND BLOOD PARAMETERS

Boudour Khedidja^{1*}, Daoudi-Zerrouki Nacira², Lankri Elhassen¹, Aichouni Ahmed³

¹Hassiba Benbouali University, Chlef, Algeria.

²Resources Naturals Laboratory- Mouloud Maameri University, Tizi-Ouzou, Algeria.

³El Wancharissi University, Tissemsilet, Algeria.

*Corresponding author: Tel: (+213) 027727906. E-mail: k.boudour@univ-chlef.dz

ABSTRACT

Malva sylvestris (*Malvaceae*) is an annual plant widely used as a medicinal plant in Algeria. In order to contribute to the search for better zootechnical performance of adult rabbits (*Oryctolagus cuniculus*), the effect of the incorporation of *Malva sylvestris* leaf and stem powder on some zootechnical (feed intake, body weight, scrotal perimeter, antioxidant capacity) and blood parameters (NSF, triglyceride content, cholesterol content) of male rabbits (six-seven months old) was studied in this work. Lot L2 (n=18) received the standard food of the control lot (L1, n=18), supplemented with 3% *Malva sylvestris* powder. Duration of two-month supplementation with *Malva sylvestris* powder had a positive impact on the parameters studied. The high levels of phenolic compounds (polyphenols and total flavonoids) and tannins found in the rabbits must have improved the antioxidant power, body weight and scrotal perimeter of the treated rabbits. No significant differences were revealed in hematological parameters.

Key words: Rabbit, *Malva sylvestris*, Oxidative power, Live weight, Cholesterol-triglyceride

INTRODUCTION

In Algeria, rabbit breeding is in continuous development. Its meat has become more and more appreciated by the population. Rational breeding is carried out there with a diet based exclusively on rabbit pellets. However, it is recognized that plants are the major source of medicines thanks to their richness in products known as secondary metabolism products (Eddouks, 2007). Plant extracts are used in rabbit nutrition in order to reduce stress and induced pathologies and, consequently, reduce the use of antibiotics (Briens *et al.*, 2005). Ben-Shaul *et al.* (2000) showed a decrease in oxidative stress in rabbits receiving plant extracts. Among these plants, *Malva sylvestris*, was a good candidate to substitute antibiotic-based additives and hormonal injections that are banned because of the antibiotic resistance that threatens human health after consumption (Briens *et al.*, 2005).

Malva sylvestris is an annual perennial herbaceous plant of the *Malvaceae* family. It is well known in Algeria and the Mediterranean basin region and is widely used as a medicinal plant because of its soothing properties for the respiratory tract, useful for the treatment of many internal and external symptoms and inflammations such as sore throat, mouth ulcers, bronchitis, hoarseness and laryngitis.

The objective of this work is to supplement the powdered feed of the *Malva sylvestris* plant known in Algeria as "el khobeiza" on some zootechnical parameters (body weight, weight gain, feed intake, and testicular size), and on some serum biochemical parameters (cholesterol and triglycerides) in male rabbits.

MATERIAL AND METHODS

Animals and experimental design

The aerial parts of *Malva sylvestris* were harvested in December 2018 in the Chlef region. The harvested parts (leaves and stems) were dried and ground to powder as a supplement.

In the rabbit farm of the Hassiba Benbouali University of Chlef, 36 male rabbits of the Algerian synthetic strain "ITELV 2006", aged between 6 to 7 months and having an average weight of 3575 ± 95 g were kept

in individual cages designed in wire mesh. The rabbits received 150g/day of a pelleted commercial feed containing on dry matter basis: alfalfa (29%), corn (18%), soybean meal (12%), molasses (3.5%), amino acids (0.3%), calcium (0.89%), phosphate (0.60%), trace elements, salt (0.6%) and vitamins(10,000IU/kg).The chemical composition of the diets was analyzed by Wende's method for crude fiber, Kjeldahl method for proteins, solvent extraction for fat, oven drying at 105 ° C for the dry matter, incineration at 500-550 ° C in a muffle furnace for the ashes, colorimetric methods for calcium and spectrometric method for phosphorus. The analytical characteristics are given in Table 1. Access to water was free and ensured by an automatic watering system.

Table 1: Chemical composition of diet (%)

Component	Lot 1
Dry matter	91.4
Ashes	7.51
Crude protein	14.5
Crude fibre	9.49
Fat	3.38
Calcium	0.89
Phosphorus	0.60

The 36 rabbits were divided, according to the diet, into two homogeneous lots (n = 18): a control lot (L1) and an experimental lot (L2). For the batch (L2), the standard diet was supplemented by the daily addition of 3% of the powder of *Malva sylvestris*. In order to obtain a homogeneous mixture and to allow animals to completely consume the added *Malva sylvestris* powder, half of the feed was moistened to dissolve the powder sprinkled on it. The diets were distributed in the morning and the quantities consumed and refused were weighed daily. The evolution of the body weight and the size of the testes was followed during the whole experimental period by weekly weights and measurements. Blood samples were taken from the arteries of the ears in heparin tubes,

then centrifuged at 3000 rpm for 10 minutes and were subjected of biochemical parameters assaying in quantitative and qualitative analysis (FNS), triglycerides and cholesterol.

Phytochemical analysis and evaluation of antioxidant activity

Chemical analyses included the determination of polyphenols by Folin-ciocalteu reagent according to Li *et al.* (2007), the determination of flavonoids by aluminium trichloride according to Bahorunet *al.* (1996). The total tannin content was estimated by the method of Edeogaet *al.*(2005). The antioxidant activity of the extract obtained was determined by trapping the free radical DPPH (2,2-diphenyl-1-picrylhydrazyl), which is purple in colour and turns yellow when is reduced by a proton donor (Molyneux, 2004).

Statistical Analysis

Data collected were analyzed using XLstat(2016) software for calculations and descriptive analysis. All parameters studied were analyzed by a fixed-effects analysis of variance model including the effect of diet as main effect.

RESULTS AND DISCUSSION

Phytochemical analysis

The polyphenolic density of *Malva sylvestris*, presented in Table 2, was higher compared to the 220 mg/100 g value reported by Shyamala and Jamuna (2010) for a methanolic extract of *Malva pavora* of the same genus. Our samples contained acceptable levels of flavonoids compared to *Beta vulgaris*(6.85mg/g, Aidaoui *et al.*,2013).

Table 2: Content of *Malva sylvestris* in phenolic, flavonoid and tannin compounds (in mg/g)

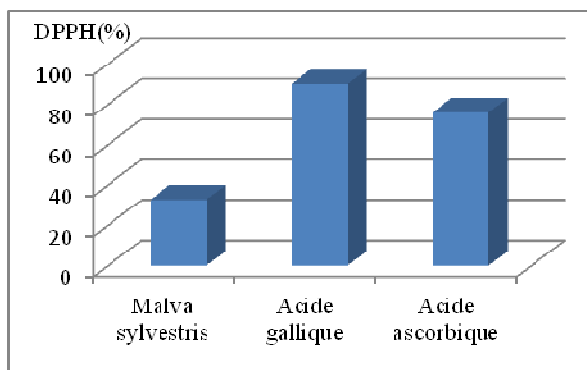
Chemical compound	Content
Phenolic compounds	4.3
Flavonoids	5.5
Tannins	1.7

Antioxidant activity

Figure 1 shows a significant inhibitory power of *Malva sylvestris* (32.8%) compared to

standard antioxidants (gallic acid and ascorbic acid). This is probably attributed to the presence of phenolic compounds which are known as antioxidant substances with the ability to trap radical species and reactive forms of oxygen (Hennebelle *e tal.*, 2004). Mansouri *et al.*(2005); Beta *et al.*(2005); Samaniego-Sánchez *et al.*(2007), have shown that the antioxidant capacity determined by the DPPH test increases

Figure 1:Antioxidant power of *Malva sylvestris*.



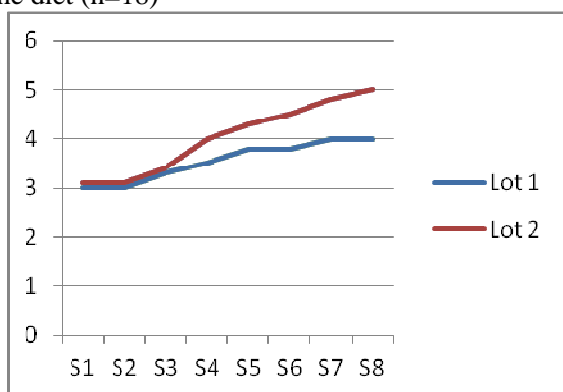
	Lot 1	Lot2	P-value
Feed intake	142	125	<0.05
Initial weight	3530	3625	<0.05
Final weight	3690	3826	<0.05
Weight gain	65	296	<0.05

(2016) recorded a much higher content (30.5%) of crude protein. The incorporation of *Malva sylvestris* powder into the feed had a significant effect ($P<0.05$) on the change in body weight of rabbits for eight weeks compared to the control. This can be explained by the high protein level in the diet for L2. Indeed, Lebas and Ouhayoun (1987) reported that the rate of growth and the body composition increases with a high protein level.

Testicles

The diet exerts a significant effect ($P<0.05$) on the circumference of the testicles (Figure 2). Our result is in agreement with Khudair Ahmed and Khalil Ibrahim (2016) who reported an increase in the testicular weight in the quail fed by *Malva parviflora* (same genus as *Malva sylvestris*).

Figure 2:Evolution of the rabbit scrotal perimeter (cm) during the experimental period according to the diet (n=18)



with those reported by Shahriyari *et al.* (2018) who demonstrated that *Malva sylvestris* complements have significantly reduced blood glucose, triglycerides and cholesterol.

with the polyphenol content. The good antioxidant power of our samples can also be attributed to the flavonoids which are excellent, natural antioxidants, (Panovska *et al.*, 2005).

Feed intake and body weight of rabbits

The results in Table 3 showed a significant effect ($P<0.05$) of the addition of *Malva sylvestris* powder to the feed. Indeed, a clear improvement in weight and feed intake was observed on animals of L2. The low intake of L2 may be due to a relatively high protein level. Chemical analysis of the dried leaves of the mallow revealed that the plant contains 19.3% of protein in the stems and 18.9% in the leaves. In France, Flores (2011) gave a protein content of *Malva sylvestris* stems of 14.3%, while Barros *et al.* (2010) recorded a rate of 12.2% protein in the leaves. Khudair Ahmed and Khalil Ibrahim

Blood count formula (FNS)

The FNS analysis does not reveal any significant difference ($P>0.05$) between animals of the two groups (Figure 3). This is in contradiction with Hajyaniet *al.* (2015) who observed that the extract of *Malva sylvestris* increased significantly the major plasma parameters.

Biochemical parameters

Triglyceride assays showed a significant decrease in the L2 lot compared to the control lot (280 vs 180 g/dl, while the level of cholesterol was higher in lot 2 (90 vs 18 g/dl). Our results are in agreement

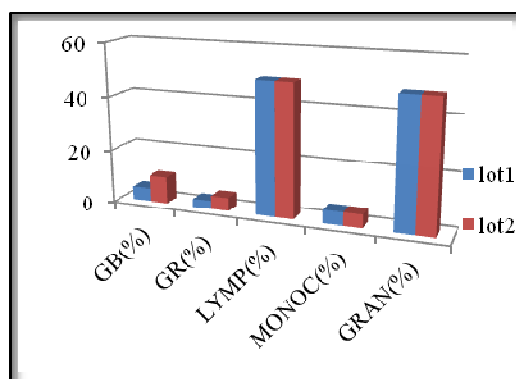


Figure 3: Blood counts (%) (n=18)

CONCLUSION

Supplementation of rabbits' feed with additives based on *Malva sylvestris* could improve the zootechnical performance of male rabbits, such as the increase in their body weight and the decrease in the feed intake thanks to its antioxidant capacity. The hematological parameters measured showed that Malva powder did not have effect on the SNSF parameters (white blood cells, red blood cells, lymphocytes, granulocytes and platelets), but reduced cholesterol and triglycerides. Our results deserve to be continued by other studies to take into account the phytobiotic importance in improving animal performance.

REFERENCES

- Aidaoui W., BoulhoulouKh., Menasri A N. 2013. Contribution to the study of the effect of two plants (*Beta vulgaris* and *Rutachalepensis*) on the complications of diabetes. *University 08 May 1945 Guelma (102)*, 1-127.
- Barros Lilian, Carvalho A.N., Ferreira I., 2010. Leaves, flowers, immature fruits and leafy flowered stems of *Malva sylvestris*: a comparative study of the nutraceutical potential and composition food and chemical. *Toxicology*, 48, 1466-1472.
- Belarbi M. 2004. Study of the nutritional and anti-nutritional compounds of oak acorns and the nutritional efficiency of their proteins in growing Wistar rats. *Doctoral thesis. University of Tlemcen*.
- Ben-shaulEN-V., LomnitskiL., NyskaA., CarbonattoM., PeanoS., ZurovskyY., BergmanM., Eldridge S. R., Grossman S. 2000. Effect of natural antioxidants and apocynin on LPS-induced endotoxemia in rabbit Hum. *Toxicology*, 19 (11), 604 – 614
- Beta T., Nam S., Dexter J E., Sapirstein H D. 2005. Phenolic content and antioxidant activity of pearled wheat and roller-milled fractions. *Cerealchemistry*, 82, 390-393.
- Flores Maeva, 2011. *Malvasylvestris L. et autres mauves de France*. Thèse de doctoratenpharmacie 221p.
- Fortun Lamothe L., DrouetViard F.2001. Food and immunity: II State of knowledge and research prospects for rabbits. *9th Journ. Rech. Cunicole Fr., Paris*, 97-110. ITAVI Ed., Paris.
- Hennebelle T., Sahpaz S., Bailleul F. 2004. Plant polyphenols, sources, uses and potential in the fight against oxidative stress. *Phytotherapy*, 1, 3-6. <http://www.coniculture.info/docs/indexbiol.htm>.(access 03/2009).
- Khudair Ahmed S. and Khalil Ibrahim D. 2016. Effect of adding mallow or parchment powder (*Malva parviflora L.*) in the depths Physiological characteristics and productive performance of Japanese quail. *Anbar Journal of VeterinarySciences Pan, (1)*, 1999-6527.
- Lebas F., Ouhayoun J. 1987. Impact of the protein level of the feed in the breeding environment and the season on the growth and meat quality of the rabbit. *Ann. Zootechnics*, 36 (4), pp 421-423.
- Mansouri A., Embarek G., Kokkalou E., Kefalas P. 2005. Phenolic profile and antioxidant activity of the Algerian ripe date palm fruit (*Phoenix dactylifera*). *Food Chemistry*, 89, 411-420.
- Samaniego-Sánchez C., González A.M.T., García-Parilla M.C., Granados J.J.Q., Serrana H.L., Martínez M.C.L. 2007. Different radical scavenging tests in virgin olive oil and their relation to the total phenol content. *Analytica Chimica Acta*. 593: 103-107.
- Shahriyari F., Askari GH., R.Sadeghianshahi M., R.Ebadi Asl H., Sharifat R., Abbasi H. 2018. The effect of Aerobic exercise and *Malva Sylvestris* supplements on the lipid profile, glucose and WHR in obese and inactive women. *Journal of Advanced Pharmacy Education & Research* 3, 121-128
- Shyamala BN and Jamuna P. 2010. Nutritional Content and Antioxidant Properties of PulpWaste from *Daucus carota* and *Beta vulgaris*. *Malaysian Journal of Nutrition*. 16 (3), 397- 408.