Effect of Drinking Water Supplementation with Phyto-Additives (Horseradish, Dog-Rose, French Tamarisk and Grapes) on Parameters at Slaughtering in Young Rabbits

Marian Bura[1], Paula Iuliana Bohatâr[1], Silvia Pătruică[1*], Sorin Voia[1], Cristina Pîrvuleţ[2], Dan Ţigănele[1]

[1] *Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara,Calea Aradului, 119, 300645, Timisoara, Romania*
[2] *Academy of Agricultural and Forestry Sciences, Bd. Mărăşti, nr. 16, 011464 Bucureşti, România*

Abstract
At the end of the experimental period (105 days), the entire group of young rabbits studied was slaughtered. Successive to this, we determined the following indices: mean live body weight at the end of the experimental period, mean carcass weight, mean gain at slaughtering, mean mass of internal edible organs (liver, heart, lungs and kidneys) and the proportion of internal organs in carcass mass, in hybrid young rabbit. According to the analyses of differences between the control rabbit group and the group with French tamarisk, the group with horseradish and the one with grapes, we observed significant differences ($p<0.05$) in terms of live body weight and body after killing (after bleeding and skinning), skin mass and internal organs mass (liver, heart, lungs and kidneys). During the comparison of the control group with the group with horseradish, in terms of body mass after skinning, and of the control group with the group with grape seeds in terms of heart mass, the differences were insignificant ($p>0.05$). By comparing the experimental groups to each other, we determined insignificant differences ($p>0.05$) between all the parameters studied at slaughtering.

Keywords: parameters at slaughtering, rabbits, young hybrids.

1. Introduction

It is well-known that the young rabbits are very sensitive to digestive affections, which can cause several mortalities after weaning (bigger than 20%) in livestock. In order to achieve a higher productivity, a bigger degree of survival in young livestock and a better health status, we introduced antibiotics with feeding, in sub-therapeutic doses, which functioned as forage additives due to their positive effect on mortality, growth and degree of forage utilization. However, we observed that the administration of antibiotics favours the development of anti-bioresistant bacteria, and these represent a risk for human health.

For this reason, the European Union has prohibitted the utilization of antibiotics as forage additives and encouraged the identification of alternative sources which should function as growth promoters [1-3]. During the last years, the utilization of plant extracts as forage additives has been more and more extended. The natural character of these represented the priority in their selection [4-7]. These botanical additives (phyto-additives or phytogenics) may include, according to the bioactive principles contained (determined by the antimicrobial properties; prophylactic), a stimulative effect, too. The medicinal effect relies on the action exerted by some bioactive components, like: alkaloids (analgesic), flavonoids (diuretic, anti-inflammatory, antispastic), bitter

* Corresponding author: Silvia Pătruică, patruica_silvia@yahoo.com

substances (digestive, antimicrobial), mucilaginous substances (gastric anti-inflammatory, laxative), saponins (anti-inflammatory), tannins (astringent), phenols (antibacterial) and glycosides. The consequences of the bio-stimulative effect are: stimulation of growth and feed intake, improvement of digestion and feed capitalization, increase of immune capacity and implicitly the improvement of growth performances. The specialty researches have the objective to determine the bioactive components of the plants used and the level of their utilization, and finally to determine the productive performances of the young individuals submitted to experiments.

2. Materials and methods

At the end of the experimental period (105 days), the entire livestock of young rabbits was slaughtered. For all the individual from lots (control, with water supplemented with phyto-additives consisted of horseradish, dog-rose, French tamarisk and grape seeds), we determined: live body mass, post-bleeding body mass, post-skinning body mass, skin mass, carcass mass and the mass of some internal organs (liver, heart, lungs and kidneys). The data recorded was statistically processed [8] and we determined the significance of differences. With the differences between live body mass and post-bleeding body mass, we obtained the blood amount lost at slaughtering. We calculated the percentage of skin in live body mass. The output at slaughtering was determined with the report between the mean of carcass mass x 100/the mean of live body mass. Also, we calculated the percentage of edible internal organs within carcass mass.

3. Results and discussions

The study of the nine mass determinations, carried out before and after slaughtering, was performed in the control lot and also in the four experimental lots (extracts of dog-rose, French tamarisk, horseradish and grape seeds) (Table 1).

In the rabbits from control lot, the blood amount lost at slaughtering, calculated as the difference between mean live body mass and mean post-slaughtering body mass, was 24 g. Skin mass represented 14.05% of live body mass. The output at slaughtering, calculated with the report between the mean of carcass mass x 100/the mean of live body mass, was 55.66%. By reporting the mass of some edible internal organs to carcass mass, we obtained a liver percentage of 4.23%, a heart percentage of 0.68%, a lung percentage of 1.31% and kidney percentage of 1.17%. On the whole, the edible parts (carcass and edible internal organs) weighed 736 g, representing 59.77% of live body mass. The variability coefficient presented reduced values (CV<10%) for live body mass, post-bleeding body mass, post-skinning body mass and carcass mass, medium values (CV=10-20%) for skin mass, heart mass, lung mass and kidney mass, and big values (CV>20%) for liver mass. The mean safety index (Sx%) was satisfactory (Sx%<5%) in terms of precision for live body mass, post-bleeding body mass, post-skinning body mass and carcass mass. For all the other mass determinations, the mean is not satisfactory in terms of precision (Sx%>5%).

In the case of the lot with drinking water supplemented with dog-rose extract, we obtained an amount of lost blood of 87.50 g, a percentage of skin mass of 12.67% within live body mass, and an output at slaughtering of 52.03%. The percentage of internal organs within carcass mass represented 4.19% for liver, 0.55% for heart, 1.76% for lungs and 1.12% for kidneys. The total edible parts (1651.76 g) of live body mass represented 56.01%. The variability coefficient presented a medium value (CV=10-20%) for liver and big values (CV>20%) for live body mass, post-bleeding body mass, post-skinning body mass, skin mass, carcass mass, heart mass, lung mass and kidney mass. The values of mean safety index for all mass characters are not satisfactory in terms of precision (Sx%>5%).

In case of the lot which was offered drinking water with French tamarisk extract, we obtained an amount of lost blood of 115.55 g, a percentage of skin mass of 10.57% within live body mass, an output at slaughtering of 55.78%. The total edible parts (1802.75 g) represented 59.17% of the live body mass. Within carcass mass, the internal organs represented the following percentages: liver 3.53%, heart 0.68%, lungs 0.90% and kidneys 0.96%. The variability coefficient presents reduced values (CV<10%) for kidney mass, medium values (CV=10-20%) for body mass (live, post-bleeding, post-skinning), skin mass, carcass mass, liver mass and lung mass, and also a big value (for heart mass). The value of mean safety index was satisfactory in terms of precision for kidney mass (Sx%=4,61%) and not satisfactory for all the other characters (Sx%>5%).

Table 1. Live body mass, after slaughtering, and internal organ mass, in young rabbits from the control and experimental lots

Specification	Live body mass	Post-bleeding body mass	Post-skinning body mass	Skin mass	Carcass mass	Organs mass			
						Liver	Heart	Lungs	Kidneys
Control lot									
N	4	4	4	4	4	4	4	4	4
X	1231.33	1207.33	899.00	173.00	685.33	29.00	4.67	9.00	8.00
Sx	37.02	43.29	27.06	17.58	15.35	5.01	0.33	1.00	0.58
S	64.05	74.90	46.81	30.41	26.56	8.66	0.58	1.73	1.00
Cv	5.20	6.20	5.21	17.58	3.88	29.86	12.37	19.25	12.50
Sx%	3.00	3.58	3.01	10.16	2.23	17.27	7.06	11.11	7.25
Min. val.	1175	1140	858	153	670	24	4	7	7
Max. val.	1301	1288	950	208	716	39	5	10	9
Lot with dog-rose extract									
n	4	4	4	4	4	4	4	4	4
X	2949.25	2861.25	2165.75	373.75	1534.75	64.25	8.50	27.00	17.25
Sx	366.49	374.69	303.83	40.60	245.17	4.52	0.87	6.98	1.89
S	732.98	749.38	607.65	81.20	490.33	9.03	1.73	13.95	3.77
Cv	24.85	26.19	28.06	21.73	31.95	14.06	20.38	51.68	21.88
Sx%	12.42	13.09	14.02	10.86	15.97	7.03	10.23	25.85	10.95
Min. val.	2103	1998	1493	273	925	54	6	15	13
Max. val.	3824	3748	2906	459	2065	76	10	45	22
Lot with dog-rose extract									
n	4	4	4	4	4	4	4	4	4
X	3046.80	2931.25	2332.50	322.00	1699.75	60.00	11.50	15.25	16.25
Sx	162.02	197.60	168.99	16.64	90.57	3.89	1.55	1.03	0.75
S	362.92	395.21	337.98	33.28	181.13	7.79	3.11	2.06	1.50
Cv	11.91	13.48	14.49	10.33	10.66	12.98	27.04	13.52	9.23
Sx%	5.31	6.74	7.24	5.16	5.32	6.48	13.47	6.75	4.61
Min. val.	2481	2407	1886	273	1489	50	8	13	15
Max. val.	3470	3366	2707	347	1909	69	15	17	18
Lot with horseradish extract									
n	4	4	4	4	4	4	4	4	4
X	3172.00	3077.00	2438.50	349.00	1794.00	63.50	8.00	17.00	16.50
Sx	377.12	366.09	258.27	41.12	228.68	7.52	0.00	1.00	0.50
S	531.74	516.19	364.16	57.98	322.44	10.61	0.00	1.41	0.71
Cv	16.76	16.78	14.93	16.61	17.97	16.70	0.00	8.32	4.29
Sx%	11.88	11.89	10.59	11.78	12.74	11.84	0	5.88	3.03
Min. val.	2796	2712	2181	308	1566	64	8	31	13
Max. val.	3548	3442	2696	390	2022	76	8	45	16
Lot with grade seed extract									
n	4	4	4	4	4	4	4	4	4
X	2888.00	2803.50	2121.25	382.75	1582.50	63.75	9.75	18.75	16.50
Sx	250.02	252.99	203.86	37.93	168.94	3.92	1.70	1.55	2.36
S	500.04	505.98	407.72	75.87	337.88	7.85	3.40	3.10	4.73
Cv	17.31	18.05	19.22	19.82	21.35	12.31	34.91	16.51	28.64
Sx%	8.65	9.02	9.61	9.90	10.67	6.14	17.43	8.26	14.30
Min. val.	2317	2247	1622	324	1135	56	5	16	13
Max. val.	3530	3459	2612	494	1942	71	13	23	23

The lot offered horseradish extract in its drinking water presented an amount of lost blood of 95 g, a percentage of skin mass of 11% within live body mass, an output at slaughtering of 56.55%. In carcass mass, the edible internal organs presented the following percentages: liver 3.54%, heart 0.45%, lungs 0.95% and kidneys 0.92%. The total edible parts (1899 g) represented 59.87% of live body mass. The variability coefficient presented reduced values (CV<10%) for heart, lungs and kidneys, medium values (CV=10-20%) for live body mass, post-bleeding and skinning, skin mass, carcass mass and liver mass. The value of mean safety index is satisfactory in terms of precision (Sx%<5%) only in the case of kidney mass, and it is not satisfactory in terms of precision (Sx%>5%) for all the other mass characters studied.

In the lot who received drinking water supplemented with grape seed extract, we obtained an amount of lost blood of 84.5 g, a percentage of skin mass of 13.25% within live body mass, and an output at slaughtering of 54.79%. Within carcass mass, the internal organs presented the following percentages: liver 4.03%, heart 0.62%, lungs 1.18% and kidneys 1.04%. The total edible parts (1691.25 g) represented 58.56% of live body mass. The variability coefficient presented medium values (CV=10-20%) for live body mass, post-bleeding and post-skinning, skin mass, liver and kidney mass, and also big values (CV>20%) for carcass mass, heart mass and kidney mass. The value of mean safety index of all mass characters is not satisfactory in terms of precision (Sx%>5%).

By using the Mann-Whitney test, we determined the significance of differences between the nine mass characters obtained in the control and experimental lots (Table 2).

Table 2. The significance of differences between the control and the experimental lots, in young rabbits

Character		Value		Difference		Significance
		Control lot	Dog-rose lot	Absolute values (g)	Relative values (%)	
Control lot/Dog-rose lot						
Live body mass		1231.33±37.02	2949.25±366.49	-1717.92	41.75	0.03*
Post-bleeding body mass		1207.33±43.29	2861.25±374.69	-1653.92	42.19	0.03*
Post-skinning body mass		899.00±27.06	2165.75±303.83	-1266.75	41.50	0.03*
Skin mass		173.00±17.58	373.75±40.60	-200.75	46.28	0.03*
Carcass mass		685.33±15.35	1534.75±245.17	-849.42	44.65	0.03*
Organ mass	Liver	29.00±5.01	64.25±4.52	-35.25	45.13	0.03*
	Heart	4.67±0.33	8.50±0.87	-3.83	54.94	0.03*
	Lungs	9.00±1.00	27.00±6.98	-18	33.33	0.03*
	Kidneys	8.00±0.58	17.25±1.89	-9.25	46.37	0.03*
Control lot/French tamarisk lot						
Live body mass		1231.33±37.02	3046.80±162.02	-1815.47	40.41	0.03*
Post-bleeding body mass		1207.33±43.29	2931.25±197.60	-1723.92	41.18	0.03*
Post-skinning body mass		899.00±27.06	2332.50±168.99	-1433.5	38.54	0.03*
Skin mass		173.00±17.58	322.00±16.64	-149	53.72	0.03*
Carcass mass		685.33±15.35	1699.75±90.57	-1014.42	40.31	0.03*
Organ mass	Liver	29.00±5.01	60.00±3.89	-31	48.33	0.03*
	Heart	4.67±0.33	11.50±1.55	-6.83	40.60	0.03*
	Lungs	9.00±1.00	15.25±1.03	-6.25	59.01	0.03*
	Kidneys	8.00±0.58	16.25±0.75	-8.25	49.23	0.03*
Control lot/Horseradish lot						
Live body mass		1231.33±37.02	3172.00±377.12	-1940.67	38.81	0.04*
Post-bleeding body mass		1207.33±43.29	3077.00±366.09	-1869.67	39.23	0.03*
Post-skinning body mass		899.00±27.06	2438.50±258.27	-1539.5	36.86	0.05ns
Skin mass		173.00±17.58	349.00±41.12	-176	49.57	0.03*
Carcass mass		685.33±15.35	1794.00±228.68	-1108.67	38.20	0.03*
Organ mass	Liver	29.00±5.01	63.50±7.52	-34.5	45.66	0.03*
	Heart	4.67±0.33	8.00±0.00	-3.33	58.37	0.03*
	Lungs	9.00±1.00	17.00±1.00	-8	52.94	0.03*
	Kidneys	8.00±0.58	16.50±0.50	-8.5	48.48	0.03*
Control lot/grape lot						
Live body mass		1231.33±37.02	2888.00±250.02	-1656.67	42.63	0.03*
Post-bleeding body mass		1207.33±43.29	2803.50±25299	-1596.17	43.06	0.03*
Post-skinning body mass		899.00±27.06	2121.25±203.86	-1222.25	42.38	0.03*
Skin mass		173.00±17.58	382.75±37.93	-209.75	45.19	0.03*
Carcass mass		685.33±15.35	1582.50±168.94	-897.17	43.30	0.03*
Organ mass	Liver	29.00±5.01	63.75±3.92	-34.75	45.49	0.03*
	Heart	4.67±0.33	9.75±1.70	-5.08	47.89	0.07 ns
	Lungs	9.00±1.00	18.75±1.55	-9.75	48	0.03*
	Kidneys	8.00±0.58	16.50±2.36	-8.5	48.48	0.03*

During the analysis of the significance of differences (table 2) between the control lot and the lot with dog-rose extract regarding live, post-bleeding and post-skinning body mass, carcass mass, and also the mass of some internal organs (liver, heart, lungs and kidneys), we achieved the existence of some significant differences (p<0.05) between measurements, in the two lots.

The lot with French tamarisk extract presented, compared with the control lot, significantly ($p<0.05$) superior values of the nine mass characters.

When comparing the experimental lots with horseradish extract and grape seed extract with the control lot, eight of the mass characters presented significant ($p<0.05$) differences and one presented an insignificant ($p>0.05$) difference. Also insignificant ($p>0.05$) differences were observed between the horseradish lot and the control lot in terms of post-skinning body mass, and between the grape seed lot and the control lot in terms of heart mass.

With successive analyses of the differences between the four experimental lots (dog-rose, French tamarisk, horseradish and grapes), we obtained insignificant ($p>0.05$) differences between all the characters studied.

4. Conclusions

1. In the control and experimental lots, the young rabbits lost at slaughtering 24-115.55 g blood and recorded a skin percentage of 10.57-14.05% in live body mass, an output at slaughtering of 52.03-56.55% and a percentage of total edible parts (carcass mass plus the mass of edible internal organs) of 56.01-59.87% in live body mass.
2. Successive to the analyses of the significance of differences between the control lot and the experimental lots with dog-rose extract and French tamarisk extract, we achieved the existence of significant ($p<0.05$) differences between the nine mass measurements studied (live body mass, post-bleeding body mass, post-skinning body mass, skin mass, carcass mass and the mass of edible internal organs represented by liver, heart, lungs and kidneys).
3. By comparing the experimental lot which received in their drinking water horseradish extract and grape seed extract with the control lot, eight of the mass characters presented significant ($p<0.05$) differences and one presented an insignificant ($p>0.05$) difference. The insignificant differences ($p>0.05$) were determined between the lot with horseradish and the control lot, regarding post-skinning body mass, and between the lot with grapes and the control lot, regarding heart mass.
4. With successive analyses of the differences between the experimental lots (dog-rose/French tamarisk, dog-rose/horseradish, dog-rose/grape, French tamarisk/horseradish, French tamarisk/grape, horseradish/grape), we achieved insignificant ($p>0.05$) differences between all the mass characters studied.

5. References

1. Pla, M., Guerrero, L., Guardia, D., Oliver, M.A., Blasco, A. Carcass characteristics and meat quality of rabbit lines selected for different objectives: I. Between lines comparison; Livestock Production Science, 1998, 54, 115-123.
2. Dalle, Zotte, A. Perception of rabbit meat quality and major factors influencing the rabbit carcass and meat quality; Livestock Production Science, 2002, 75, 11-32.
3. Bura, M. Proiectarea fermelor de iepuri de casă; Ed. Eurobit Timişoara, 2012.
4. Pop, I.M., Halga, P., Avarvarei, Teona. Nutriţia şi alimentaţia animalelor; Tipo Moldova, Iaşi, 2006, 2, 327-541.
5. Bercea, Lăcrimioara. Hreanul, medicament natural; http://www.ziare.com/viatasanatoasa, 2009.
6. Georgevici, Claudia. Beneficiile curei de struguri; http://adevărul.ro/medicinanaturista, 2010.
7. Marinescu, L. Culoarea verde a sănătăţii; Ed. Cellina Bucureşti, 2013.
8. Brudiu, Ileana. Biostatistica în abordarea practică; Ed. Eurobit Timişoara, 2010.