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Study Regarding the Multiple Stress Influence over Productive Performances of Laying Quails (*Coturnix Coturnix Japonica*)

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Abstract - Being acquainted with the fact that in the field of quails breeding the literature is still deficient and that these birds have a very intense metabolism, which makes them more sensitive to stress in comparison with other species, a research has been conducted on a total number of 3368 of mixed and meat quails divided in 6 differentiated lots based on age and productive specialization. They have been exposed for 5 hours to multiple stresses (without light, ventilation, water, food). It can be affirmed that the stress effect over the quails that are in the first part of the laying curve (until the three laying month) is affecting less the laying process, but influences more their death rate. The situation is reversed for the quails that are in the second part of the laying curve (after the sixth month of laying), the effect of multiple stress applied to those birds being more influential on the laying process and less in the death rate. The consumption of compound feed and the feed conversion have varied very little while the birds were under stress, with the exception of the most elder lot, that was in the XIIth month of laying, for which the feed conversion rose by 14% in the week that followed the stress conditions, getting up with 22,5% bigger in the fourth week after the applied stress, while the laying has been reduced proportionally with less than half of these values.

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Study Regarding the Multiple Stress Influence over Productive Performances of Laying Quails (*Coturnix Coturnix Japonica*)

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Abstract - Being acquainted with the fact that in the field of quails breeding the literature is still deficient and that these birds have a very intense metabolism, which makes them more sensitive to stress in comparison with other species, a research has been conducted on a total number of 3368 of mixed and meat quails divided in 6 differentiated lots based on age and productive specialization. They have been exposed for 5 hours to multiple stresses (without light, ventilation, water, food). It can be affirmed that the stress effect over the quails that are in the first part of the laying curve (until the three laying month) is affecting less the laying process, but influences more their death rate. The situation is reversed for the quails that are in the second part of the laying curve (after the sixth month of laying), the effect of multiple stress applied to those birds being more influential on the laying process and less in the death rate. The consumption of compound feed and the feed conversion have varied very little while the birds were under stress, with the exception of the most elder lot, that was in the XIIth month of laying, for which the feed conversion rose by 14% in the week that followed the stress conditions, getting up with 22,5% bigger in the fourth week after the applied stress, while the laying has been reduced proportionally with less than half of these values.

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I. INTRODUCTION

The strong concentration of the quails in a farm requires a special care for all the activities, as well as the correct functioning of all technological systems (watering and feeding systems, ventilation, etc.) because any fluctuation of these factors leads to the decrease of the production and the rise of the death rate due to the high sensitivity of the quails to induced stress in exploiting conditions.

II. MATERIALS AND METHODS

The research has been made in the S.C. Ferma Nova S.R.L. farm in Bucharest on a flock of laying quails from the egg-meat population "Balotesti" and a flock of "Faraon" meat population that have been exposed to multiple stress conditions. The stress has been

produced in the month of June, for 5 hours, during which period the electrical power has been shut down. As a result, the ventilation, the lighting and the water systems were not functioning, the temperature in the breeding room has risen, water was missing and the birds were unable to feed themselves due to the lack of illumination. Thus the quails have been exposed to stress from all these point of view.

The stress effect has been monitored by analyzing the egg production, the death rate and the compound feed consumption, that have been performed in the week prior to the multiple stress exposure (referred to further on in the study as week I) and for the following 4 weeks after the stress exposure (referred to further on in the study as week II, III, IV and V). The study has been undertaken on an initial group of 3040 "Balotesti" layers divided by age in five relatively equal batches, as follows: batch L1 – quails in the first laying month, L2 – quails in the third laying month, L3 – quails in the VIth laying month, L4 – quails the VIIIth laying month, L5 – quails in the XIIth laying month. The "Faraon" lot (L6) has comprised 328 layers in the first laying month.

The data processing was done with the aid of the software program Microsoft Excel 2003. The testing of the significance of the differences among the averages values has been done with the aid of the Student test.

III. RESULTS AND DISCUSSION

At the laying quails of the mixed "Balotesti" population that were in their first laying months (batch L1), the exposure to multiple stress didn't modified the laying process in a negative manner, that rosed in the weeks that followed the stress exposure (from $4,88 \pm 0,11\%$ in week I, before the stress to $34,78 \pm 0,51\%$ in week II, $64,88 \pm 0,52\%$ in week III, $72,55 \pm 0,56\%$ in week IV and $75,34 \pm 0,45\%$ after the stress exposure, table 1, figure 1). On the other hand, the death rate (table 2, figure 2) increased ($0,68 \pm 0,08\%$ in week II, to $1,09 \pm 0,10\%$ in week III, $0,89 \pm 0,10\%$ in week IV and $0,65 \pm 0,10\%$ in week V after the stress exposure, in comparison to $0,13 \pm 0,03\%$ in week I, before the stress exposure).

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At "Balotesti" quails that were in the third laying month (lot L2) the same evolution was ascertained as well as for the quails in their first laying month, with death rate and laying percentages corresponding to their age (table 1 and table 2).

For the quails in the VI th month of laying (batch L3) the situation is changing, meaning that the stress exposure has led to the decrease of the laying percentage and the increase of the death rate percentage during the first week after the stress exposure (from 74.88 ± 0.79 medium egg laying percentage in week I, before stress exposure, to $71.87 \pm 0.71\%$ in week II, $76.94 \pm 0.87\%$ in week III, $75.65 \pm 0.44\%$ in week IV and $76.55 \pm 0.34\%$ in week V after the stress exposure, and regarding the medium death rate percentage, in relation to 1.85 ± 0.11 in week I, prior to the stress exposure, $2.37 \pm 0.12\%$ in week II, $1.05 \pm 0.09\%$ in week III, $0.95 \pm 0.05\%$ in week IV and $0.85 \pm 0.10\%$ in week V after the stress exposure).

For the "Balotesti" quails in their VIII th egg laying month (lot L4) stress exposure has led to tendency of laying percentage decrease, which is not

statistically insured, as the laying was constant (table 1). The death rate percentage was also on a normal trajectory for this age (table 2), without being influenced by the five hours stress.

For the "Balotesti" quails in their XII th egg laying month (lot L5) stress exposure has led to a stronger decrease in laying, of about 7% in the first week after stress exposure, the difference being still significantly lower in the following weeks in comparison with week I. The death rate percentage seems not to have been influenced, remaining practically constant in the second week and following a normal trajectory for these ages. Related to the „Faraon" meat quails population, in the first laying month during the multiple stress exposure, the research has revealed a resembling situation to those of the mixed "Balotesti" population, with the difference that the death rate percentage increased more in the „Faraon" quails in comparison to "Balotesti" quails in the following week after the stress exposure (on an average of 0, 76% at L6 in comparison with 0, 68% at L1).

Table 1 : The evolution of the laying before and after the exposure to the multiple stresses

Batch	Productive age	Specification	Week I	Week II	Week III	Week IV	Week V
L1	1 month of laying	Laying %	$4.88 \pm$ <i>aaa</i> <i>bbb</i> <i>ccc</i> <i>ddd</i> 0,11	$34.78 \pm$ <i>aaa</i> <i>eee</i> <i>fff</i> <i>ggg</i> 0,51	$64.88 \pm$ <i>bbb</i> <i>eee</i> <i>hhh</i> <i>iii</i> 0,52	$72.55 \pm$ <i>ccc</i> <i>fff</i> <i>hhh</i> <i>jjj</i> 0,56	$75.34 \pm$ <i>ddd</i> <i>ggg</i> <i>iii</i> <i>jjj</i> 0,45
		Eggs/per capita/week)	0.34 ± 0.46	2.43 ± 0.34	4.54 ± 0.23	5.08 ± 0.25	5.27 ± 0.44
L2	3 months of laying	% laying	$84.97 \pm$ <i>bbb</i> <i>ccc</i> <i>ddd</i> 0.66	$86.72 \pm$ <i>eee</i> <i>fff</i> <i>ggg</i> 0.42	$88.76 \pm$ <i>bbb</i> <i>eee</i> <i>hhh</i> <i>iii</i> 0.36	$87.54 \pm$ <i>ccc</i> <i>fff</i> <i>hhh</i> <i>jjj</i> 0.54	$86.55 \pm$ <i>ddd</i> <i>ggg</i> <i>iii</i> <i>jjj</i> 0.54
		Eggs/per capita/week)	5.94 ± 0.23	6.07 ± 0.24	6.21 ± 0.33	6.12 ± 0.34	6.06 ± 0.42
L3	6 months of laying	Laying %	$74.88 \pm$ <i>aaa</i> <i>bb</i> 0.79	$71.87 \pm$ <i>aaa</i> <i>eee</i> <i>fff</i> <i>ggg</i> 0,71	$76.94 \pm$ <i>bb</i> <i>eee</i> <i>hhh</i> <i>iii</i> 0,87	$75.65 \pm$ <i>fff</i> <i>hhh</i> <i>jjj</i> 0.44	$76.55 \pm$ <i>ggg</i> <i>iii</i> <i>jjj</i> 0.34
		Eggs/per capita/week)	5.24 ± 0.64	5.03 ± 0.64	5.38 ± 0.74	5.29 ± 0.34	5.35 ± 0.54
L4	8 months of laying	Laying %	$59.45 \pm$ 0.91	$58.77 \pm$ 0.86	$60.45 \pm$ 0.85	$58.55 \pm$ 0.56	$57.54 \pm$ 0.68
		Eggs/per capita/week)	4.16 ± 0.4	4.11 ± 0.4	4.23 ± 0.4	4.09 ± 0.4	4.02 ± 0.4
L5	12 months of laying	Laying %	$53.65 \pm$ <i>aaa</i> <i>bbb</i> <i>ccc</i> <i>ddd</i> 0.41	$46.63 \pm$ <i>aaa</i> <i>eee</i> <i>ff</i> <i>gg</i> 0.41	$49.65 \pm$ <i>bbb</i> <i>eee</i> <i>hhh</i> <i>iii</i> 0.41	$47.55 \pm$ <i>ccc</i> <i>ff</i> <i>hhh</i> <i>jj</i> 0.34	$44.13 \pm$ <i>ddd</i> <i>gg</i> <i>iii</i> <i>jj</i> 0.35
		Eggs/per capita/week)	3.75 ± 0.54	3.26 ± 0.36	3.47 ± 0.48	3.32 ± 0.57	3.08 ± 0.56

L6	1 month of laying	Laying %	44.19 ± aaa bbb ccc ddd 0.34	60.09 ± aaa eee fff ggg 0.61	70.16 ± bbb eee hhh iii 0.91	74.57 ± ccc fff hhh jjj 0.58	77.78 ± ddd ggg iii jjj 0.78
		Eggs/per capita/week)	3.09 ± 0.74	4.21 ± 0.46	4.91 ± 0.65	5.22 ± 0.84	5.44 ± 0.67

Note: among the figures marked with the same 3 letters the difference is highly significant, among those marked with 2 the difference is distinctly significant and among those marked with 1 letter the difference is significant. Among the unmarked figures the differences are not significant.

The combined feed consumption (table 2) varied little in accordance with multiple stress exposure of the birds for five hours. The feed conversion has also been influenced with the exception of lot L5, being in its XII th laying month, for which it increased by 14% in the

week following the stress exposure, although the laying has decreased with only 7.02%, being with 22.5% higher in the IV-th week after the stress exposure, whereas the egg laying has decreased with only 9.5 %.

Table 2 : The evolution of the death rate, of feed consumption and feed conversion

Lot	Productive age	Specification	Week I	Week II	Week III	Week IV	Week V
L1	1 month of laying	Death rate (%)	0,13 ± aaa bbb ccc ddd 0,02	0,68 ± aaa eee fff ggg 0,08	1.09 ± bbb eee hhh iii 0,10	0.89 ± ccc fff hhh jjj 0,10	0.65 ± ddd ggg iii jjj 0,10
		Feed consumption (g/capita/day)	28.05 ± 0.45	27.5 ± 0.35	29.5± 0.34	30.3± 0.24	30.6± 0.34
		Feed conversion (g/egg)	574.79 ± 2.42	79.07± 0.66	45.47± 0.34	41.76± 0.24	40.61± 0.43
L2	3 months of laying	Death rate (%)	0,64 ± aaa bbb ccc ddd 0,08	1,86 ± aaa eee fff ggg 0,15	1,05 ± bbb eee hhh iii 0,09	0,95 ± ccc fff hhh jjj 0,05	0,85 ± ddd ggg iii jjj 0,10
		Feed consumption (g/capita/day)	33.45 ± 0.43	32.44 ± 0.33	33.85 ± 0.34	33.95± 0.45	34.35± 0.46
		Feed conversion (g/egg)	39.37 ± 0.34	37.40 ± 0.55	38.14 ± 0.35	38.78± 0.67	39.68± 0.64
L3	6 months of laying	Death rate (%)	1,85 ± aaa bb 0,11	2,37 ± aaa eee fff ggg 0,12	1,65 ± bb eee hhh ins 0,11	1,74 ± cns fff hhh jjj 0,12	1,65 ± dns ggg ims jjj 0,09
		Feed consumption (g/capita/day)	35.57 ± 0.43	35.00 ± 0.54	36.34 ± 0.44	36.85 ± 0.46	36.95 ± 0.36
		Feed conversion (g/egg)	47.5 ± 0.56	48.69 ± 0.67	47.23 ± 0.54	48.71 ± 0.35	48.27 ± 0.76
L4	8 months of laying	% Death rate	2,29 ± 0,13	1,91 ± eee fff ggg 0,12	2,79 ± eee 0,12	2,55 ± fff 0,15	2,27 ± ggg 0,34
		Feed consumption (g/capita/day)	37.35 ± 0.55	37.65 ± 0.37	37.85 ± 0.45	38.10± 0.54	38.20± 0.64
		Feed conversion (g/egg)	62.82 ± 0.55	64.06± 1.05	62.61 ± 0.87	65.10 ± 0.65	66.38 ± 0.76

L5	12 months of laying	Death rate (%)	2,59 ± <i>cc</i> 0,16	2.58 ± 0,11 <i>ee</i> <i>ff</i> <i>g</i>	2.98 ± <i>ee</i> <i>ii</i> 0,15	2.88 ± <i>cc</i> <i>ff</i> <i>jj</i> 0,23	2.68 ± <i>g</i> <i>ii</i> <i>jj</i> 0,15
		Feed consumption (g/capita/day)	39.25 ± 0.75	39.65 ± 0.35	40.45 ± 0.38	41.25 ± 0.67	41.65± 0.67
		Feed conversion (g/egg)	73.15 ± 0.65	85.03± 0.54	81.47 ± 1.03	86.75 ± 0.98	94.38± 0.88
L6	1 month of laying	Death rate (%)	0,22 ± <i>aa</i> <i>bb</i> <i>cc</i> <i>dd</i> 0.05	0,76 ± <i>aa</i> <i>g</i> 0.11	0.71 ± <i>bb</i> <i>i</i> 0.09	0.78 ± <i>cc</i> <i>j</i> 0.07	0.98 ± <i>dd</i> <i>gg</i> <i>i</i> <i>j</i> 0.08
		Feed consumption (g/capita/day)	29.1 ± 0.55	30.2 ± 0.64	30.45 ± 0.34	31 ± 0.44	31.23± 0.54
		Feed conversion (g/egg)	65.85 ± 0.77	50.26 ± 0.67	43.54 ± 0.75	41.57 ± 0.56	40.16 ± 0.45

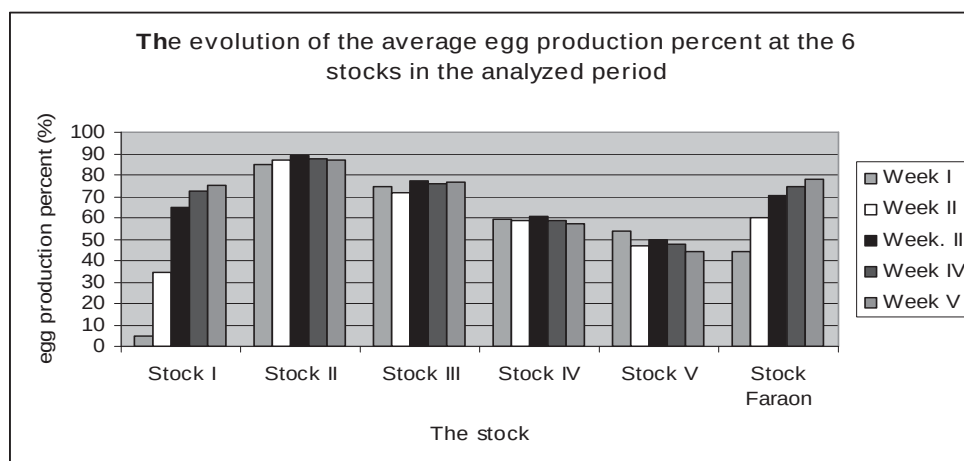


Figure 1 : The average percentages of laying for the analyzed lots during the five weeks

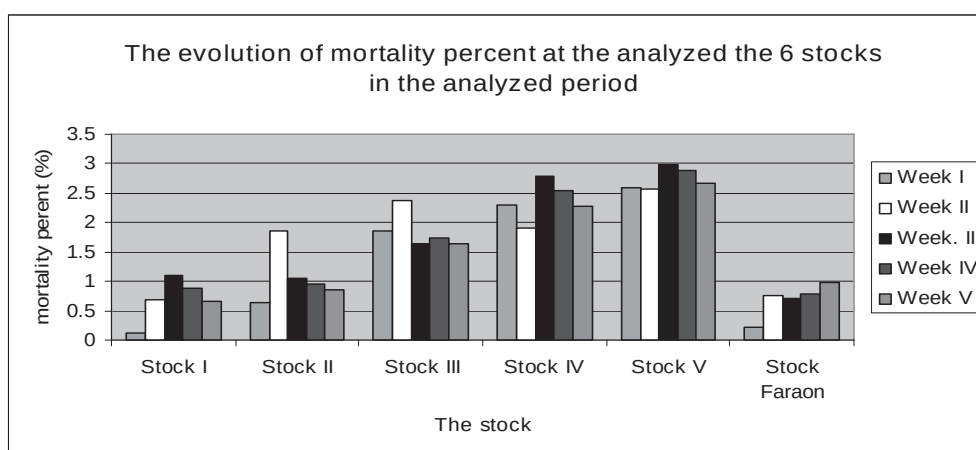


Figure 2 : The average percentages of death rates in the analyzed lots

IV. CONCLUSIONS

After exposing to a five hours multiple stress (increase of the shelter temperature, lack of light, water and food) the quails of the Balotesti and Faraon populations the following conclusions can be presented.

For the quails in their first 3 months of egg laying, the stress didn't lead to a decrease of the laying percentage, this being on an increasing curve. On the other hand the death rate has increased, 5.2 times over for the "Balotesti" quails and 3.4 times for the "Faraon" quails in the following first week after the stress exposure.

For the quails over six months of laying, there has been a decrease of the medium laying percentage especially in the first week after the stress exposure, the death rate being on a relative normal slope for this age.

In the second week after the multiple stress exposure (third week in the tables), the quails are starting to recover, meaning that the egg production for the following three weeks is increasing in comparison to the second week and their death rate is decreasing.

The combined feed consumption varied very little in accordance with the stress exposure of the birds for five hours. The feed conversion has also less been influenced with the exception of the lot being at the end of the laying cycle, for which it increased in the weeks following the stress exposure, being with 22,5% higher in the fourth week after the stress exposure, period during which the laying decreased less pro rata.

As a general conclusion, it can be affirmed that if the quails are exposed to a multiple stress for five hours, in the first week after this exposure, the laying percentage and the death rate are affected in a differentiated way in accordance with the layers' age, that are recovering in the immediate following week. Special problems are created by the death rate, having as consequence the decreasing of the number of productive quails. The study on the effects of a multiple stress exposure longer than five hours of the quails remains an open subject.

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