UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE, IAŞI, ROMANIA

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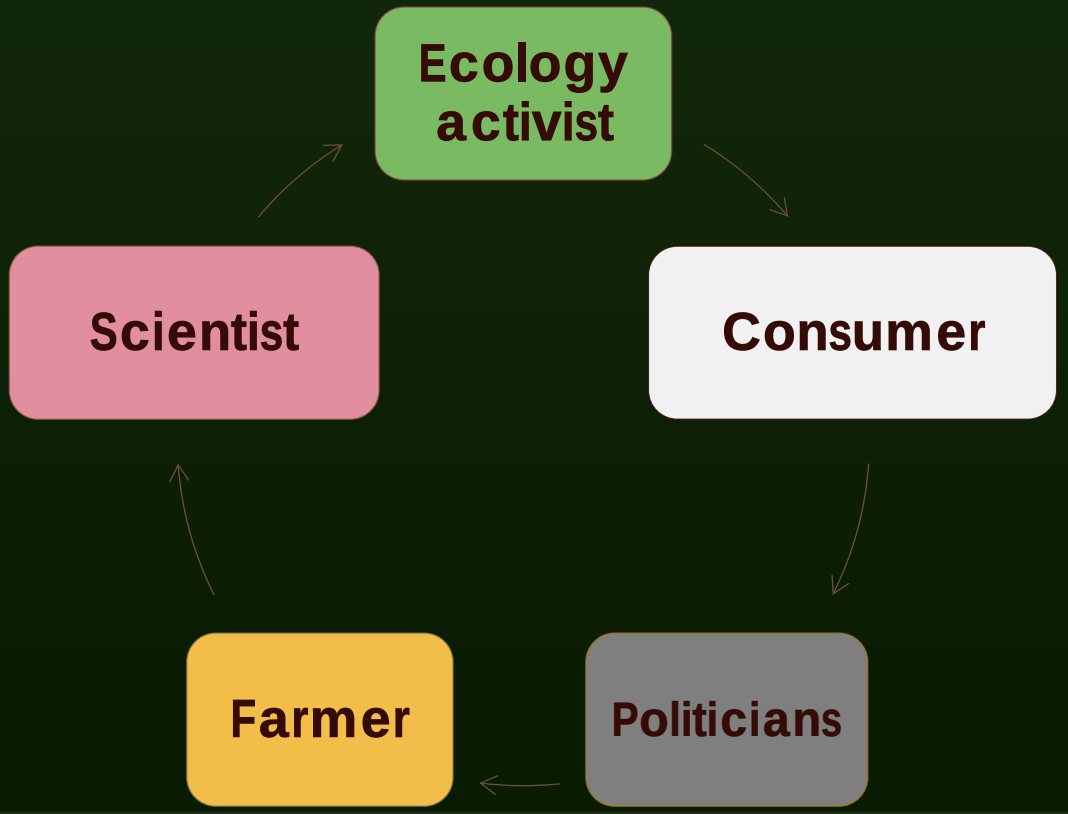
Internal defects incidence and heavy metals excretion in hens eggs produced within conventional and alternative farming systems

by C. RADU-RUSU et al.

POULTRY PRODUCTION

WELFARE & LEGISLATION

- Idea of protecting farm animals: "loi Grammont", France - 1850.
- How to define welfare or to establish limits in exploitation to avoid animals mistreatments?
- Conflict of opinions between:



MATERIAL AND METHODS

Convention cages system (group C)

Improved cages system (group C)

Free range system (group FR)

1500 Lohmann Brown hens, 28 weeks old

300 EGGS

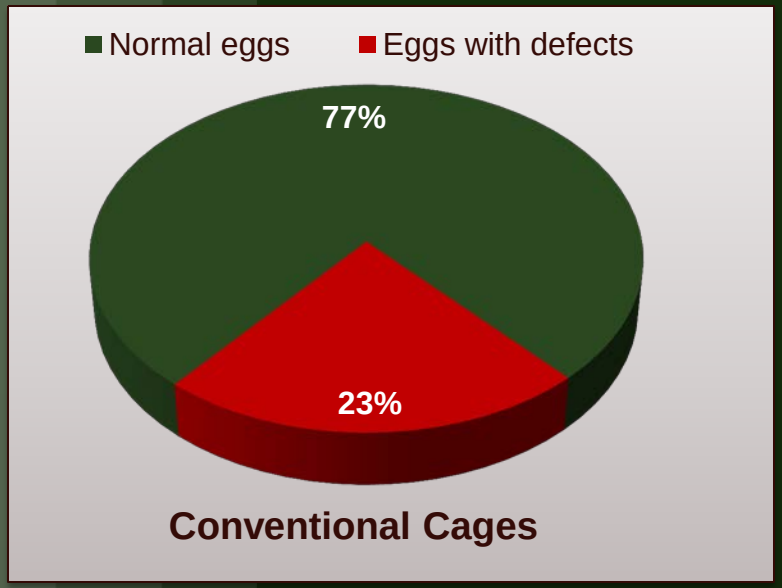
*** Trace elements (heavy metals) content**
by atomic absorption spectrophotometry
(caliration curve in 5 points)

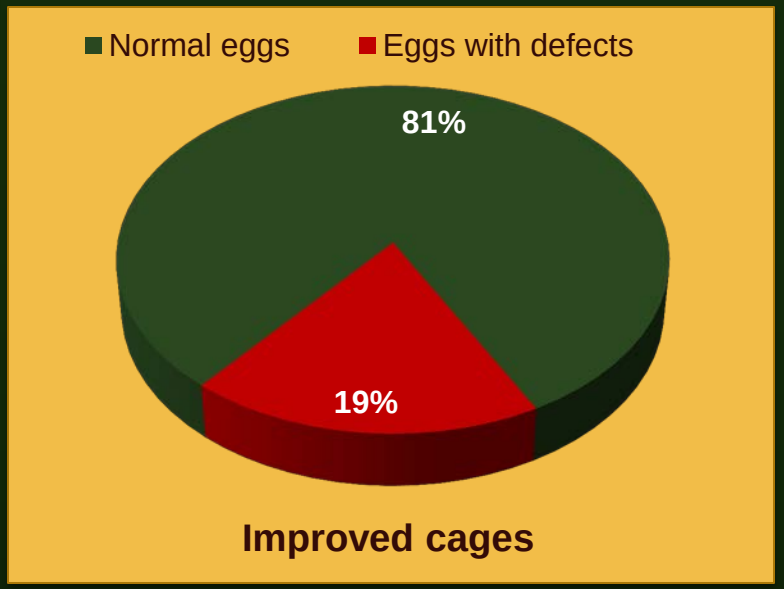
*** Internal defects incidence**

Detection limits:
Pb=0.012 mg/kg (ppm)
Cd=0.016 mg/kg (ppm)
Cu=0.006 mg/kg (ppm)
Zn=0.020mg/kg (ppm)
Zn=0.016µg/kg (ppb)

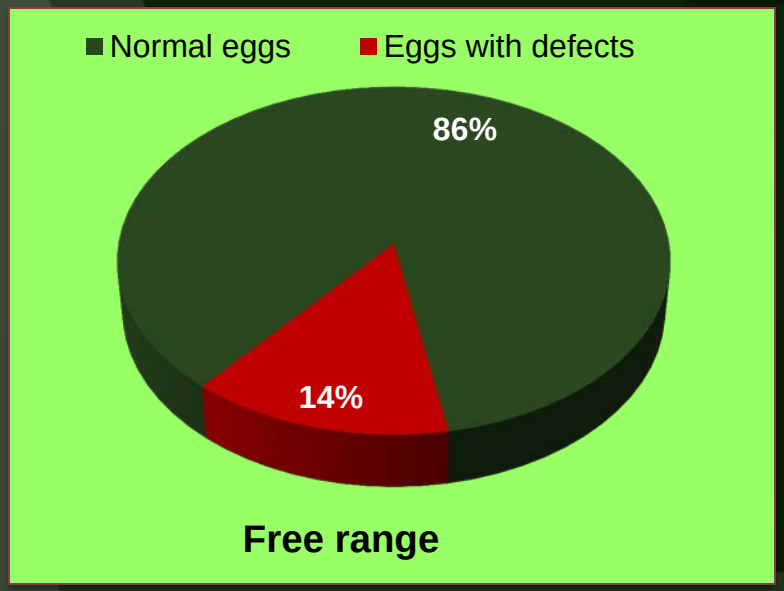
Statistics:
ANOVA single factor

ACHIEVED RESULTS





Incicence of internal defects in eggs, related to hens husbandry system



ACHIEVED RESULTS

Heavy metals excreted in the eggs laid by hens reared in conventional and alternative technological systems and transferability of such pollutants, reported to feed uptake

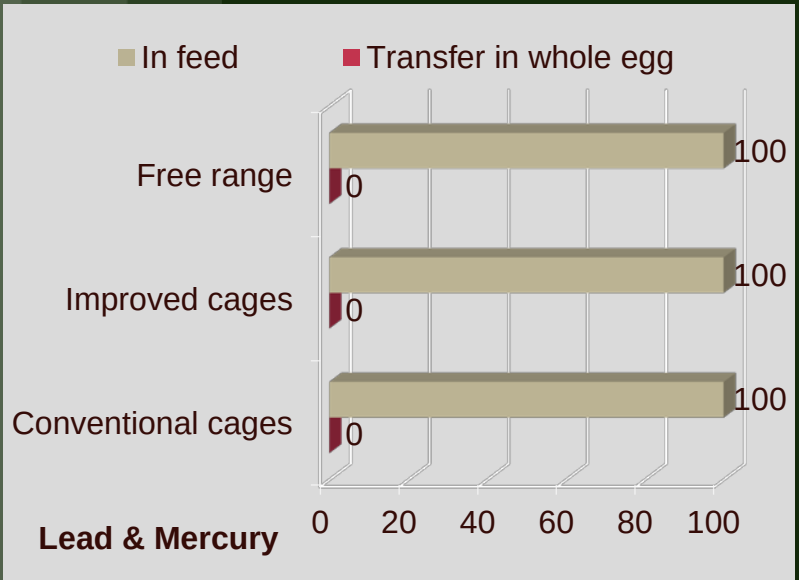
Egg compartment	Asessed metal	C group (conventional cages)	N group (new furnished cages)	F group (free-range farming)
		mean±st.dev.	mean±st.dev.	mean±st.dev.
Complete, mixed feed	Pb ppm (mg/kg)	0.106±0.007	0.083±0.014	0.107±0.011
	Cd ppm (mg/kg)	0.035±0.004	0.034±0.011	0.038±0.009
	Cu ppm (mg/kg)	5.06±0.123	5.17±0.063	5.11±0.084
	Zn ppm (mg/kg)	19.30±0.576	19.65±0.180	19.41±0.286
	Hg ppb (µg/kg)	BDL*	BDL	BDL
White	Pb ppm (mg/kg)	BDL	BDL	BDL
	Cd ppm (mg/kg)	0.003±0.001	0.002±0.001	0.004±0.001
	Cu ppm (mg/kg)	**1.810^{b}±0.679**	**1.754^{a}±0.734**	**1.880^{c}±0.752**
	Zn ppm (mg/kg)	0.064±0.008	0.063±0.015	0.077±0.012
	Hg ppb (µg/kg)	BDL	BDL	BDL
Yolk	Pb ppm (mg/kg)	BDL	BDL	BDL
	Cd ppm (mg/kg)	0.021±0.005	0.018±0.008	0.024±0.007
	Cu ppm (mg/kg)	**2.617^{b}±0.190**	**2.553^{a}±0.031**	**2.693^{c}±0.174**
	Zn ppm (mg/kg)	5.367±0.108	5.346±0.081	5.447±0.125
	Hg ppb (µg/kg)	BDL	BDL	BDL
Whole egg	Pb ppm (mg/kg)	BDL	BDL	BDL
	Cd ppm (mg/kg)	0.025±0.004	0.026±0.010	0.029±0.009
	Cu ppm (mg/kg)	**4.427^{b}±0.68**	**4.335^{a}±0.371**	**4.592^{c}±0.481**
	Zn ppm (mg/kg)	5.502±0.099	5.427±0.105	5.531±0.101
	Hg ppb (µg/kg)	BDL	BDL	BDL

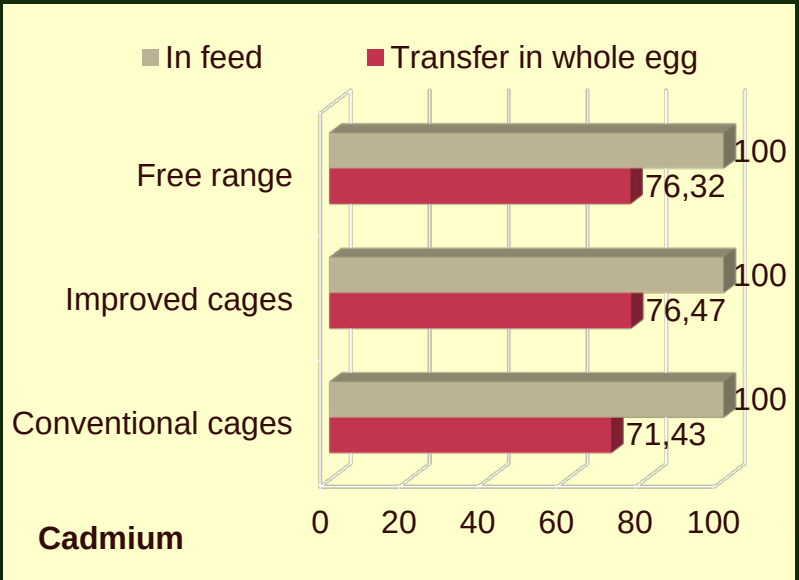
*BDL – below analytical detection limit

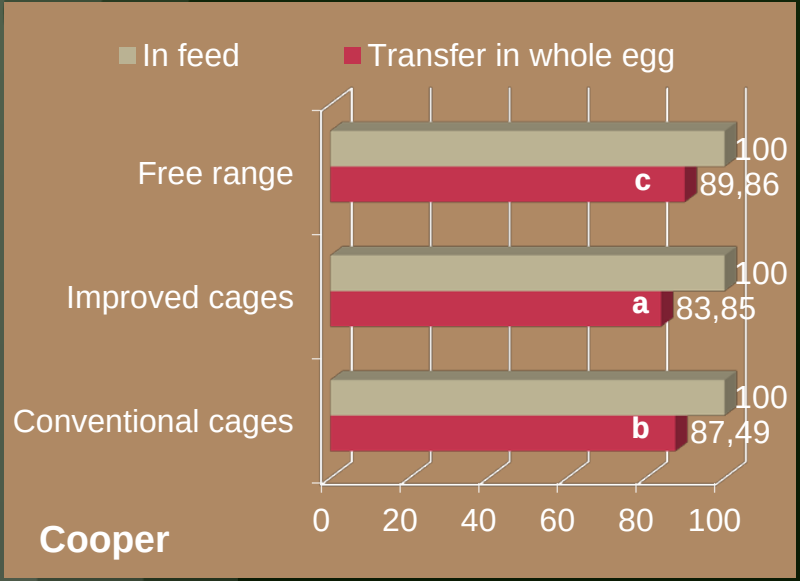
^{ab} or ^{bc}– different superscripts within row: statistically significant differences ($p<0.05$) between groups

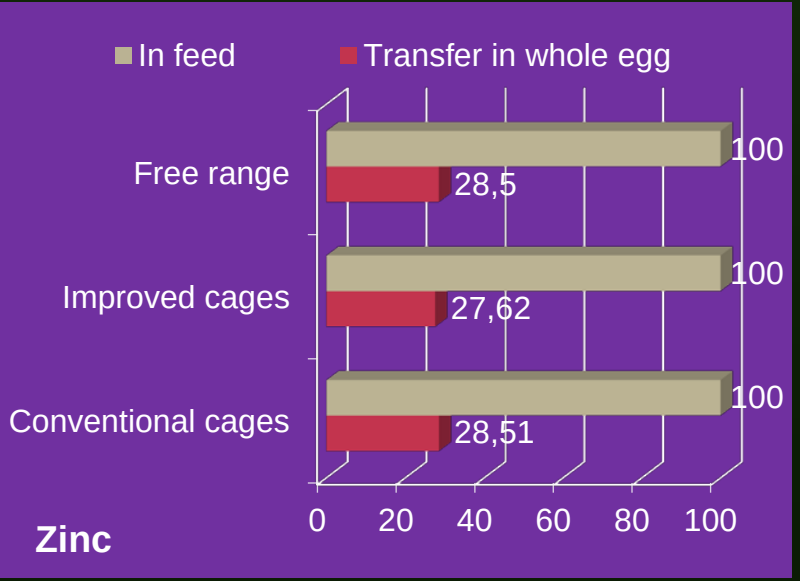
^{ac} - different superscripts within row: statistically distinct significant differences ($p<0.01$) between groups

ACHIEVED RESULTS









CONCLUSIONS

- Trace elements known as heavy metals were transferred from feed to eggs more intense in the hens accommodated in free range system, compared to those accommodated in furnished cages.
- Less heavy metals were found in the eggs laid in enriched cages, one of the alternative husbandry systems which meet the requirements of the European poultry welfare legislation.
- Under all circumstances, the heavy metals content of the eggs was situated below the upper tolerable level of toxicity for human consumers.
- The occurrence of internal eggs nonconformities was lower in the free range system, proving less stressful conditions for laying hens within this farming technology.

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