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RESEARCH NOTE

Long term feeding of Bt-corn – a ten-generation study with quails

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Abstract
A ten-generation experiment with growing and laying quails were carried out to test diets with 40 (starter) or 50% (grower, layer) isogenic or transgenic (Bt 176) corn. Feeding of diets containing genetically-modified corn did not significantly influence health and performance of quails nor did it affect DNA-transfer and quality of meat and eggs of quails compared with the isogenic counterpart.

Keywords: *Genetically-modified plants, Bt-corn, Japanese quails, ten generations, performance, DNA transfer*

1. Introduction

The worldwide cultivation of genetically-modified plants (GMP) increased from $1.7 \cdot 10^6$ to $81 \cdot 10^6$ ha from 1996–2004. Most of the cultivated plants are crops of the so-called first generation without substantial changes in composition or without output traits. Substantial equivalence of such plants, as well as food and feeds from GMP of the first generation, has been demonstrated by numerous analysis and feeding studies as summarized recently (Flachowsky et al. 2005). Most of the feeding studies were of short duration. International bodies (EFSA 2004, ILSI 2003, 2004, OECD 2003) consider that long-term feeding studies generally add little to a nutritional assessment of feeds from GMP of the first generation. But nevertheless, the public is asking for results from long-term studies regarding aspects such as of animal health and well-being, unexpected/unintended effects, fertility and DNA-transfer. Therefore a ten-generation experiment was carried out with growing and laying Japanese quails as model animals with short generation intervals including Bt (*Bacillus thuringiensis*) 176 corn in the diets.

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2. Material and methods

Basal diets were formulated to contain 40% (starter) or 50% (growers, hens) corn (isogen corn or Bt 176 corn). Starter and grower diets were fed to Japanese quails, on average to 70 male and 75 female chicks of each group (weeks 1 – 6), layer diets were fed to 32 hens each

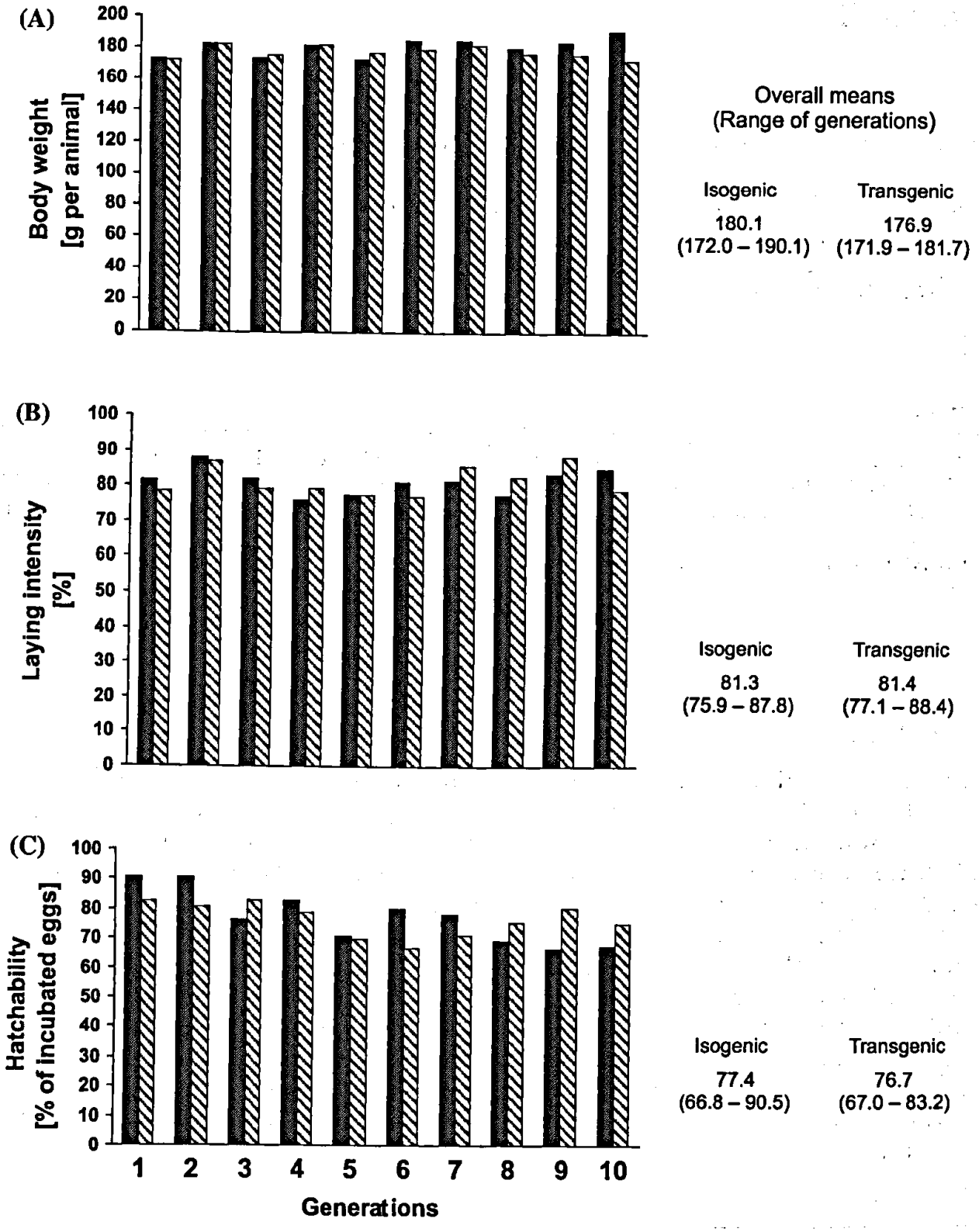

Figure 1. (A) Body weight of female quails (age: 6 weeks), (B) laying intensity and (C) hatchability of quails fed with isogenic (■) and transgenic (Bt, ▨) corn.

from weeks 7–12. Feed and water were provided for *ad libitum* consumption and performance parameters were registered. Rotation crossing was used to avoid in-breeding. Eggs were collected at a quail hen age of 10 weeks. A total of 210 eggs per group were used for each hatch. After 12 weeks, six breeding quails each were slaughtered, and samples from the digestive tract, from body tissues and eggs were taken to follow the course of DNA. Sixteen breeding quails of each generation were fed a whole year with the experimental diets and slaughtered to follow the course of DNA after these long-term feeding periods. DNA was extracted with a commercial kit and recombinant DNA fragments from the Bt insert (211 base pairs) were determined by polymerase chain reaction (PCR).

3. Results and discussion

Some results are shown in Figure 1. There is a certain biological variation within and between the groups fed with isogenic or transgenic corn, but none of the differences were significant at a level of $p < 0.05$. On average, male and female quails (Figure 1A) fed with transgenic corn showed a lower body weight. Mortality of chicks and hens, laying intensity (Figure 1B), hatchability (Figure 1C), slaughtering results and organ weights did not differ between both groups.

Transgenic DNA-fragments (211 bp) were detected in the stomach and along the whole gastrointestinal tract of the quails independent on the feeding duration. In body tissues (muscle, liver, stomach, spleen, kidney, heart) and eggs, fragments of transgenic DNA could not be detected after 12 weeks of feeding Bt-corn in the diet, and also not after one year feeding Bt-corn. There is no indication of enrichment of recombinant DNA fragments after long-term exposition.

Feeding of diets containing genetically modified corn (Bt 176) for ten generations (10×12 weeks) did not significantly influence animal health, feed intake, feed efficiency, laying performance, or hatchability, nor did it affect DNA-transfer and quality of meat and eggs of quails compared with the isogenic counterparts.

References

Flachowsky G, Chesson A, Aulrich K. 2005. Animal nutrition with feeds from genetically modified plants. Arch Anim Nutr 59:1–40.

EFSA. 2004. Guidance document of the scientific panel on genetically modified organisms for the risk assessment of genetically modified plants and derived food and feed. The EFSA Journal 99:1.

ILSI. 2003. Best practices for the conduct of animal studies to evaluate crops genetically modified for input traits, Washington DC: International Life Sciences Institute. 62 p. http//www.ilsi.org/file/bestpracticescas.pdf

ILSI. 2004. Nutritional and safety assessments of foods and feeds nutritionally improved through biotechnology. Compr Rev Food Sci Food Safety 3:36.

OECD. 2003. Series on the safety of novel foods and feeds No. 9: Considerations for the safety assessment of animal feedstuffs derived from genetically modified plants, Organization for Economic Co-operation and Development, Paris, France.