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# Welfare and quality of farmed trout fed high plant protein diets.

## 2 innovative killing method effect on stress and quality indicators

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### ABSTRACT

The fish stunning/slaughtering procedure has an important role both for the ethical aspect related to animal welfare and for the potential quality of the final products. Stressful harvest procedure and killing methods can negatively influence the *post mortem* biochemical processes with a consequent faster fish freshness loss. In particular, killing procedures causing a long agony are not humane and can shorten fish shelf life; others, more humane, can have risks for the consumers health (anaesthetics or chemical substances) or are not feasible in small/medium size fish industry (spiking and knocking). The aim of this study was to compare the traditional killing method (asphyxia - A) used for rainbow trout (*Onchorynchus mykiss*) with an innovative stunning/slaughtering method (two-stage electric stun: 2s at a 500Hz electric field of 2.5V/cm and then 58s at a 50Hz electric field of 0.75V/cm - E), through the study of their effects on stress and quality indicators in fish fed with traditional fish meal (FM) or innovative 80% plant protein diet (PV80). Fish (n=30) of each group (FMA, FME, PV80A, PV80E) were stored at 1°C with ice covering and analysed from 0h to 192h from death. The following analyses were done: blood parameters (only at death); rigor index (RI%) and sensorial evaluation with EU Scheme Rule 2406/96 EEC (performed by 5 judge); eye liquor and muscular pH (pHe, pHm); ATP and its degradation products in muscle; lactic acid in muscle and fillet length (FLC) and height contraction % (FHC) (at 0, 3, 6, 24h). Fillet quality appearance was evaluated by absence/presence and size of bloodstains along the midline on the left fillet. Data were analyzed by ANOVA (killing method, diet and their interaction). Asphyxiated fish (A) died within 15-30' after prolonged struggling and agony, while innovative method stunned/killed fish (E) were immediately stunned and died in 1 minute. Asphyxiated group showed: higher values of blood glucose and muscle lactic acid; lower values of pHe and pHm at 3, 6 and 24h (P<0.01); earlier full rigor (RI 100% at 1h). RI, significantly different (P<0.001) between A and E fish until 6h after death, in E group reached 100% only at 8h. In agreement with this result, FLC of E fish showed lesser contraction both at 3 h (E 6.9 vs A 18.4%, P<0.001) and at 6h (E 13.9 vs A 18.4%, P<0.05). The same emerged for FHC at 3 h (E 0.9 vs 5.3%, P<0.001). The lower values of ATP/IMP ratio at 0, 3 (P<0.001) and 6h (P<0.01) in A fish than in E fish confirmed the stress condition of the first ones. Differences due to the diet were scarce: PV80 fish had higher pHe, pHm and inosine values at 72h (P<0.001). Fish sensorial evaluation indicated A class until 144h in all groups and B class at 192h after death, except in PV80A fish (75% in B class at 144h). As waited, some bloodstains were found in FME (26.7%) and PV80E (53.3%) fillets while A fish had negligible damages (1.7%). The bloodstains should downgraded the fillet acceptance. However, because the portion size trout are traded wholes/gutted by Italian fish industry, the problem seems less serious. The innovative killing procedure, really a fast and humane procedure, need to be improved for fillet appearance.

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