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BIOPROTECTIVE EXTRACTS FROM LACTIC ACID BACTERIA INHIBIT SPOILAGE *Lactobacillus sakei* CRL1407 IN REFRIGERATED MEAT DISCS

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Meat is recognized as one of the most perishable food. The main cause for meat deterioration is the growth of microbes including spoilage and pathogenic bacteria. Vacuum packaging (VP), modified atmosphere packaging (MAP), and chill temperatures are commonly used for increasing the shelf-life of meat and meat products. Under these conditions, psychrotrophic facultative and strict anaerobic bacteria such as *Listeria monocytogenes*, *Enterobacteriaceae*, *Brochothrix thermosphacta*, *Clostridium*, and deteriorative lactic acid bacteria (LAB) can grow causing different types of spoilage. In addition, LAB species belonging to the genera *Lactobacillus* were associated with severe acidification, production of off-odor/taste compounds and slime. However, certain LAB are well known to produce antimicrobial compounds such as organic acids, hydrogen peroxide, antifungal compounds and bacteriocins that may be exploited in the biopreservation of foods. On these bases, this study aims to evaluate the effect of bioprotective extracts (BEs) from *Lactobacillus curvatus* CRL705 and *Lactobacillus acidophilus* CRL641 against exopolysaccharide (EPS) producer *Lactobacillus sakei* CRL1407 in meat discs under VP at 4°C. Meat discs were aseptically obtained from the center of semimembranosus muscles. BEs produced by *L. acidophilus* CRL641 (BE-1) and *L. curvatus* CRL705 (BE-2) were purified (ammonium sulfate precipitation/solid phase chromatography). The discs were inoculated with *L. sakei* CRL1407 (10^3 CFU/g) and treated with combined and BEs alone. Then, they were vacuum packed and incubated at 4°C for 38 days. Microbiological counts, antimicrobial activity, pH, humidity, color, and lipid oxidation were evaluated at regular intervals. *L. sakei* CRL1407 was able to grow in control samples up to 7.77 log CFU/g after 38 days while BE-1 and BE-2 reduced their growth by 2 and 1.35 logarithmic cycles, respectively. The combined BEs caused the greatest reduction in the spoilage microorganism growth (3.31 log CFU/g) at 38 days of incubation. The antimicrobial activity was detected in treated samples with BE-1 and BE-1+BE-2 until day 16, while with BE-2 only at the initial time. The pH values were kept constant in the discs treated with combined BEs, while a decrease in those treated separately was detected. However, the greatest drop in pH was observed in the control samples. The moisture content did not present significant differences between all the analyzed samples showing values between 68.18% and 65.93%. When the color was determined, only the discs treated with BE-1 and BE-1+BE-2 did not present a perceptible change. Similarly, the most effective treatment to prevent lipid oxidation of discs during storage was combined BEs. Thus, the combination of BEs from LAB as biocontrol agents and the use of conventional preservation barriers to prevent the growth of deteriorating species will contribute to the extension of fresh meat shelf-life without quality loss.

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NON-THERMAL PLASMA AS EMERGING TECHNOLOGY FOR *Tribolium castaneum* MANAGEMENT IN STORED GRAINS AND FLOURS

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The red flour beetle, *Tribolium castaneum* (Herbst), is a major secondary pest on wheat stored in metal bins, silo-bags and is also frequently found in wheat products such as flour. Non-thermal plasmas (NTPs) are (quasi-neutral) partially ionized gases that may be produced by a variety of electrical discharges. Among the variety of NTP sources, we propose the use of an atmospheric pressure dielectric barrier discharges (DBD) as an emerging technology in the post-harvest integrated pest management. To this aim, a series of experiments were performed in order to test the lethality of such plasmas on three life stages of *T. castaneum* by measuring insect mortality, but also different physiological and biochemical parameters affecting insect fitness. The different NTP treatments were performed by increasing time of exposure to either O_2 or N_2 used as carrier gases. After 24 h, high levels of mortality (from 30 to 100%) were reached for each applied treatment, in both, larval and adult populations. In general, better results were always obtained under nitrogen environment. Mortality seems to be related to a significant water content loss and redox imbalance. The scanning of the cuticle prothorax segment using the atomic force microscopy (AFM) technique revealed that oxygen and nitrogen discharges impacted the surface body in a different way. As a consequence of the cuticle damage, the quinone-containing secretions of the prothoracic and abdominal glands were also affected. Since has been reported that egg is the most resistant stage of the *T. castaneum* life cycle, we carried out experiments on egg-containing flours to test the ovicidal activity of NTP, and the flours were evaluated at three and twelve weeks after treatments. We clearly identified one ovicidal nitrogen treatment, while the remaining NTPs just partially killed the eggs and delayed the development of life cycle. In conclusion, we identified an inexpensive physical treatment, which controls the entire life cycle of a major grain pest, avoiding chemical residues.