four multiparous Holstein cows of 553 ± 72.4 kg live weigh, at their second lactation third and average milk yield of 17.3 ± 3 kg/day were used. The experiment lasted 92 days divided into four experimental periods of 23 days each. All cows had free access to maize and alfalfa-silage in a proportion 50:50, 4 kg of concentrate/day and *ad libitum* access to water. The treatments consisted in supplementation of 0.5 kg/day of the experimental plants, the cows in the control treatment did not receive any plant. Each cow received each treatment, one in each of four periods.
The experimental variables were analysed by analysis of variance for a Latin square experimental design. The Tukey's test was applied if differences between treatments were observed. A multiple correlation analysis between all variables was also run in order to find associations that help to explain CH_4 production.
Results show that no significant differences ($p>.05$) were observed between the control and the treatments for all the variables but CH_4 production. The treatment with *C. bipinnatus* reduced CH_4 production in 98.5 L/d (<16%) in relation with the control treatment ($p<.05$). Milk composition was also not affected ($p>.05$) by the experimental plants. The multiple correlation analysis showed significant positive associations between CH_4 L/day and DMI ($r=0.5$, $p<.05$).
It is concluded that the inclusion of C. bipinnatus at low inclusion levels may be used to reduce CH4 production from enteric fermentation of cattle.

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O157

Phytoremediation as an innovative approach to control heavy metals output from livestock

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Heavy metals (HM) are widely found environmental contaminants as a result of anthropogenic activity. Metals are accumulating in the food chain through uptake at primary producer and represent a serious problem for health. Some HM are largely used as feed additives in livestock, also to optimize the growth performance and the excess metals are excreted. The risk of HM pollution due to the use of manure in agriculture has focused. Although using minimal supplements of trace minerals is suggested, strategies are required to reduce the environmental impact of animal productions. The aim of this study was to evaluate the ability of two plants to bioaccumulate trace elements, chosen according to results obtained in a previous investigation on HM in livestock, from contaminated water as a cost-effective plant-based approach of remediation, under controlled experimental conditions. Four pools (width 4.0 m, length 2.0 m, depth of 0.7 m; 695 L of water, 210 kg of soil) were assembled as mesocoms at the Città Studi Botanical Garden. Two of them were planted with *Typha latifolia* (TYT: treatment, $n=30$; TYC: control, $n=30$) and two with *Thelypteris palustris* (FPT: treatment, $n=60$; FPC: control, $n=60$). After 15 days of acclimation (T0) a solution of a mineral feed additive premix (final concentration: Zn 44,02 mg/L; Cu 8.63 mg/L; Mn 10.83 mg/L; Se 0.09 mg/L) was dissolved in the TYT and FPT. At T0, day 15 (T1) and day 45 (T2) samples of roots, leaves, stems, soil and water were collected, dried, mineralized and analyzed using inductively coupled plasma mass spectrometry in order to obtain HM content. No visual toxicity signs were observed during the entire experimental period. Results indicated that both plant species were able to uptake and translocate minerals into their tissues, reducing the available amount of metal in the mesocom. Metals were preferentially accumulated in rhizomes and roots: TYT and FPT plants showed a higher amount of Zn, Cu, Mn and Se if compared respectively with TYC and FPC (T1, T2). The increase was directly related to the exposure time. *T. palustris* appeared more effective than *T. latifolia* at translocating elements from solution to plant tissues. Zinc concentration was 651 ± 207.96 mg/kg dm and 177 ± 6.80 mg/kg dm respectively in *T. palustris* roots and *T. latifolia* roots. Results suggest that the evaluated plants may be candidates for the phytoremediation approach to control HM output from livestock.

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