

RICERCHE EFFETTUATE

IGIENE DEGLI ALIMENTI AD USO ZOOTECNICO

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Environmental-friendly tools to detoxify maize from aflatoxin B1

Proceedings of the Second DairyCare Conference 2015 : Cordoba, March 3rd and 4th 2015 / editor, C.H. Knight. - [s.l. : DairyCare COST Action FA1308, 2015]. - p 50 (P2.1) [Nr. Estr. 7210]

DairyCare Conference (2nd : Cordoba : March 3rd and 4th, 2015)

Aflatoxins, secondary metabolites with a cytotoxic, mutagenic and carcinogenic activity in both man and animals, represent one of the most important issue in food quality and safety, being maize one of the most significant target of contamination by these toxins. Maize is also amongst the most used raw materials for livestock feeding. Current state of the art indicates that, nevertheless the effort done by maize breeders, agrochemists and food process management, the tenure of aflatoxins in food is still growing. Over recent years some methods for forecasting and preventing aflatoxin contamination in field has been well established, otherwise no or few environmental-friendly approaches have been settled for preventing *A. flavus* development, seed cleaning and detoxification. This study has focused its attention on selecting bioactive compounds, exo-polysaccharides and laccase enzymes, from edible mushrooms *Trametes versicolor*, for preventing and detoxifying aflatoxins in maize. The two low cost formulations proposed, were able to inhibit the biosynthesis of aflatoxin B1 from *A. flavus*, and to degrade up to 40% of aflatoxin B1 content in contaminated maize (fig. 1). Artificial rumen experiments, confirms the effectiveness of *T. versicolor* laccase enzymes, at degrading aflatoxin B1.

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The importance of pasture in tied dairy cows

Proceedings of the Second DairyCare Conference 2015 : Cordoba March 3rd and 4th 2015 / editor, C.H. Knight. - [s.l. : DairyCare COST Action FA1308, 2015]. - p 56 (P2.9). - 3 bib ref [Nr. Estr. 7211]

DairyCare Conference (2nd : Cordoba : March 3rd and 4th, 2015)

Tie-stalls have still an important role for dairy cattle breeding, in both Europe and Italy¹. This kind of breeding is one of the most controversial for the scientific community and for public opinion. European legislator has tried to regulate tie-stall breeding but to date no indication has been given. With these assumptions, the aim of our research is to find variables which improve animal welfare for dairy cows housed in tie-stalls. We have conceived and validated (Fleiss Kappa Index and free-marginal Kappa) a method for assessing welfare of tied dairy cows. This method is based on the studies made by EFSA² and Welfare Quality³. It is composed by 77 multiple choice questions, divided in 5 areas (A: Management and Staff – 16 items, B: Structures and Equipment - 18 items, C: Animal Based Measures – 21 items, D: Control of environmental conditions and alarm systems – 7 items, E: Biosecurity – 15 items). To date, we have visited and assessed animal welfare in 53 livestock with tie-stalls situated in Northern Italy. The average number of animals per farm is 66, with the mean of 34 lactating cows and 23 kg milk/cow/day. The first important data is that only 16 (30.18%) of these livestock go on summer pasture with all the group of animals. Secondly we have noticed that cows which go to summer pasture have overall less adverse effects on Animal Based Measures (avoidance test, lesions, cleanliness, BCS, SCC, lameness, mortality) then those which are housed in tie—stalls all over the years (Pearson Index = 0.35, P value = 0.017) (Graphic 1). Although the number of data is small to draw conclusions, these preliminary results give the direction for further investigations.

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Influence of a blend of essential oils and an enzyme combination on growth performance, microbial counts, ileum microscopic anatomy and the expression of inflammatory mediators in weaned piglets following an Escherichia coli infection

Anim Feed Sci Tech. - Vol. 209 (2015). - p 219-229. - 35 bib ref [Nr. Estr. 7069]

This study evaluated the effects of nutritional supplementation with a blend of essential oils (EO, thymol and cinnamaldehyde) and an enzyme combination (XB, xylanase and β -glucanase), given alone or together, on growth performance, microbial counts, ileum microscopic anatomy and the expression of inflammatory mediators in weaned piglets challenged with Escherichia coli K88. One hundred and ninety-two weaned piglets were allocated to 8 treatments in a 35-day experiment with a 2 x 4 factorial design that compared 2 levels of oral E. coli challenge [sham (-) or infected (+)] under different dietary treatments [fed the basal diet (CTR) either with or without EO or XB individually or in combination (EOXB)]. Half of the piglets were orally challenged with E. coli O149:F4 (K88) on day 8 and 48 piglets (1 piglet/pen) were slaughtered on day 35. The E. coli challenge was found to decrease the average daily gain (ADG) and the gain to feed (G:F) ratio from days 7 to 14 ($P < 0.01$) and to increase the fecal score from 1 to 5 days post-inoculation ($P < 0.01$). EOXB supplementation decreased the fecal score compared to the challenged CTR animals during the first week post-challenge ($P = 0.02$). The E. coli challenge increased the populations of fecal Clostridia, E. coli and coliforms on day 9 ($P < 0.01$) and increased E. coli and coliforms counts on day 14 ($P < 0.01$ and $P = 0.01$, respectively). Dietary EO and EOXB reduced the fecal coliforms count compared to the CTR group on day 14 ($P = 0.02$ and $P < 0.01$, respectively). Furthermore, EOXB supplementation reduced the coliforms count ($P < 0.01$) and tended to decrease the E. coli count ($P = 0.051$) compared to the CTR group in the cecum digesta. Dietary EOXB also decreased the crypt depth and increased the villus-to-crypt ratio in piglets compared to the CTR group ($P < 0.01$). The E. coli challenge up-regulated the expression of tumor necrosis factor (TNF)- α , interleukin (IL)-1 α , toll-like receptor (TLR)2 and TLR4 ($P < 0.01$, $P = 0.01$, $P = 0.03$, $P = 0.01$, respectively), and EOXB supplementation down-regulated the expression of TNF- α ($P < 0.01$) and IL-6 ($P = 0.046$) compared to the EO group. The results suggest that the combination of EO and XB supplementation may have beneficial effects on the modulation of fecal consistency, microbial counts and ileum microscopic anatomy in weaned piglets following E. coli infection.

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Gossypol content of cotton free commercial feed for dairy cows

Ital J Food Safety. - Vol. 4 no 2 (2015). - no 5174 (p 82-84). - 15 bib ref (ultimo accesso 10/06/2016 <http://www.pagepressjournals.org/index.php/ijfs/article/view/ijfs.2015.5174>) [Nr. Estr. 7144]

Gossypol is a yellow pigment occurring in all parts of cotton plants, with the highest levels found in seeds, and it exhibits a variety of toxic effects. Few data are available on the content of gossypol in the commercial complementary feed and in feed raw materials. The present study was focused on the investigation of the presence of free gossypol in commercial complementary feed not containing cotton. A total of 50 samples of commercial complementary feed for dairy cows were performed in 29 feed mills both using and not using cotton as feed material. The free gossypol contamination resulted under the detection limit of the technique (4 mg/kg) in 12 out of 50 samples analysed and ranged from 4 to 20 mg/kg in 28 samples. In 10 samples the level of free gossypol ranged from 20 to 29.5 mg/kg. Average contamination of samples was 12.2 \pm 9.2 SD mg/kg. No significant difference ($P=0.571$) was shown in free gossypol concentration between feed produced in cotton free plants and in plants where cotton is used as feed material. Free gossypol content detected in the present study allows considering complementary feed for dairy cows not at risk. On the other hand, the

detection of free gossypol in cotton free complementary feed, probably attributable to cross contamination of feed materials upstream of the feed mill, should be further investigated.

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Prevenzione e degradazione della aflatossina B1 in mangimi a base di mais

V Congresso nazionale "Le micotossine nella filiera agro-alimentare" : Istituto Superiore di Sanità Roma, Roma 28-30 Settembre 2015 : riassunti / a cura di Carlo Brera... [et al.]. - Roma : Istituto Superiore di Sanità, 2015. - (ISTISAN Congressi ; 15/C4) p 17 [Nr. Estr. 7116]

Congresso nazionale "Le micotossine nella filiera agro-alimentare" (5. : Roma : 28-30 Settembre 2015)

MycoRed è un progetto di Ricerca finanziato nell'ambito del 7° Programma Quadro dell'Unione Europea finalizzato allo sviluppo di metodologie innovative per la riduzione del contenuto di micotossine più pericolose lungo le filiere alimentari e mangimistiche di maggiore rilievo economico. Il progetto, avviato nel 2009, ha una durata di 4 anni e vede la partecipazione diretta di numerosi prestigiosi Istituti di Ricerca, particolarmente attivi nel settore, che qui consolidano un percorso di ricerca affermato a livello europeo, garantendo continuità ai programmi di ricerca precedentemente avviati sulle micotossine in ambito comunitario. Uno dei principali punti di forza del progetto è costituito dalla visione e dall'approccio globale che ne caratterizzano sia le attività che i soggetti coinvolti. Vengono studiate le problematiche principali ed emergenti relative a micotossine in quelle filiere alimentari maggiormente esposte: aflatossine in mais e frutta secca, fumonisine in mais e frumento, ocratossina A in frumento e uva, tricoteceni e zearalenone nel frumento. Grazie ad un approccio basato sull'integrazione multidisciplinare di know-how e tecnologia, tali problematiche sono affrontate considerando aspetti e fattori spesso analizzati singolarmente. Per quanto riguarda la dimensione del progetto, i 25 partner, collaborano attivamente in diverse aree del mondo, alimentando anche una rete di esperti di altrettanto rilievo, che danno il proprio contributo in termini di co-organizzazione di eventi, supporto scientifico, confronti ed esperienze formative, favorendo un clima di costruzione congiunta e collettiva di nuove aggregazioni locali ma di respiro mondiale. Il progetto punta inoltre alla diffusione dei risultati e alla formazione specialistica a livello globale, rafforzando anche la dimensione della cooperazione con alcuni Paesi in via di sviluppo che maggiormente soffrono gli effetti negativi della contaminazione degli alimenti da micotossine sulla salute umana ed animale e sull'esportazione dei loro prodotti. Infine il diretto coinvolgimento di Paesi non UE, quali Argentina, Egitto, Russia, Sud Africa, Nigeria, di organizzazioni internazionali (CIMMYT, IITA) ed associazioni di settore (ISM, NASMN, MPU, JSM, SLAM), oltre che gli accordi formalizzati tra MycoRed ed esperti/istituzioni, attraverso 18 alleanze scientifiche intercontinentali, sta determinando di fatto il consolidamento di forti legami di cooperazione scientifica a livello mondiale. Da questo impegno congiunto dei diversi partecipanti si stanno ottenendo risultati che verranno presentati al Congresso e che possono avere diretto impatto e benefici nei confronti di diverse tipologie di utenti a vario titolo interessati alle micotossine.