

UNDERSTANDING AND COPING WITH EFFECTS OF MYCOTOXINS IN LIVESTOCK FEED

RAZUMIJEVANJE I SVLADAVANJE UČINAKA MIKOTOKSINA U STOČNOJ HRANI

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SUMMARY

Mycotoxins are toxic, secondary metabolic products of moulds. Despite different approaches to control fungal growth and subsequent mycotoxin contamination of grain these undesired compounds are formed under certain environmental conditions on the growing field plant (worldwide most important field fungi are *Fusarium* sp. and *Alternaria* sp.) as well as during storage (mainly by *Aspergillus* sp. and *Penicillium* sp.). Once produced it is very difficult to get rid of mycotoxins or even to reduce the contamination level as these toxins possess high physical and chemical stability. Mycotoxins can cause a wide variety of negative impacts on animal health, depending among various other factors on their nature and concentration. Especially chronic mycotoxicoses leading to unspecific symptoms often entail serious economic losses in animal production.

Up to now, hundreds of different mycotoxins are known, but agriculturally most important are aflatoxins, trichothecenes (e.g. DON, NIV, T-2 toxin, HT-2 toxin, DAS), zearalenone, ochratoxins A and fumonisins. Due to their structural, physical and chemical differences there is still no single approach to counteract all of them.

Successful measures with regard to mycotoxin-deactivation have to be based on mainly two different strategies: 1) elimination of toxin (adsorption) and 2) elimination of toxicity (biological detoxification).

Until now a lot of research has been conducted to adsorb mycotoxins during the digestive process of animals with products (mainly on aluminosilicate basis) directly mixed into feed. While good and scientifically explained results were obtained for counteracting aflatoxins (Ramos and Hernandez, 1996; Scott et al., 1998), adsorption of other mycotoxins was limited (e.g. ZON) or even failed (e.g. trichothecenes) under field conditions (Friend

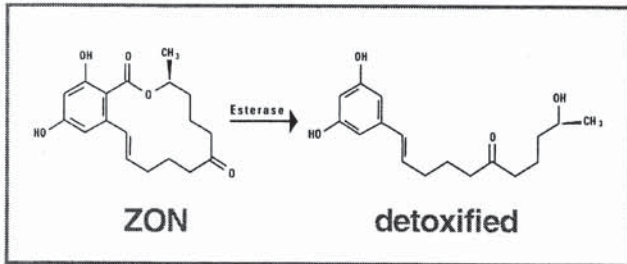
et al., 1984; Kubena et al, 1990; Huff et al, 1991; Kubena et al, 1993; Ramos et al, 1996).

Biological detoxification of mycotoxins by means of micro-organisms and/or enzymes has been subject of research for more than 30 years (Binder et al., 2000; Kollarczik et al, 1994; He at al, 1992; Yoshizawa et al, 1983 and 1984). By far the most investigated mycotoxins are members of the trichothecene family. Now it is known that their 12, 13-epoxide ring is mainly responsible for their toxic activity and removal of this epoxide group entails a significant loss of toxicity.

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Toxicity of zearalenone is based on its similarity to the female hormone estrogen. Hydrolysis of the toxin's ester group (i.e. opening of the lacton ring) by means of specific enzymes changes the mycotoxin's structure resulting in non-toxic and therefore harmless metabolites.



The presentation will introduce a product that by means of up to five modules combines both main strategies (i.e. adsorption and biological detoxification) to successfully counteract all agriculturally important mycotoxins including aflatoxins, trichothecenes, zearalenone, ochratoxin A and fumonisins.

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SAŽETAK

Mikotoksini su toksični, sekundarni metabolički proizvodi plijesni. Usprkos različitim postupcima za obuzdavanje rasta gljivice i kasnije mikotoksinskog zagađenja zrnja ovi nepoželjni sastavi nastaju u određenim okolišnim uvjetima na biljkama u rastu (najvažnije poljske gljivice širom svijeta su *Fusarium* sp. i *Alternaria* sp.) kao i za vrijeme skladištenja (uglavnom *Aspergillus* sp. i *Penicillium* sp.) Kad su jednom nastali vrlo je teško riješiti se mikotoksina, pa čak i smanjiti razinu zagađenja jer ovi toksini posjeduju vrlo visoku fizičku i kemijsku stabilnost.

Mikotoksini mogu prouzročiti čitav niz negativnih učinaka na zdravlje životinja, oviseći među raznim drugim čimbenicima o njihovoj prirodi i koncentraciji. Osobito kronične mikotoksikoze koje dovode do nespecifičnih simptoma često prouzrokuju ozbiljne gospodarske gubitke u proizvodnji životinja.

Do sada su poznate stotine raznih mikotoksina ali u poljoprivredi najvažniji su aflatoksini, trihoteceni (npr. DON, NIV, T-2 toksin, HT-2 toksin DAS), zearalenon, ohratoksini A i fumonizini. Zbog svojih strukturnih, fizičkih i kemijskih razlika još ne postoji jedinstven pristup da ih se sve suzbije.



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