Occurrence of Ergot Alkaloids in Feed

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Introduction

Fungi of the genus Claviceps infest cereals and produce sclerotia named ergot. Ergot contain different alkaloids, which exert toxic effects on human and animal health. To reduce the risk of poisoning in the EU a maximum in feed is set to 0.1% for ergot in all feedingstuffs containing unground cereals. The determination of the ergot content is performed by sorting and is therefore inapplicable for processed feed. Furthermore the toxic potential of ergot and consequently its impact on animal health is dependent on its alkaloid composition and content. An average of ergot alkaloids of 0.2 % is assumed for Europe, but the content and composiiton of ergot alkaloids are highly variable. Only few data on the alkaloid pattern, toxicity and content exist. Therefore no limits have been set for alkaloids until now.

To get an overview about the exposure of feed with ergot alkaloids we examined 53 samples feed grain and 38 samples mixed feed from Bavaria during the last two years (2005 and 2006). For that purpose we developed an HPLC method to analyse the content of the five ergot alkaloids ergometrine, ergotamine, α-ergocryptine, ergocornine and ergocrystine.

Method

Sample amount:	25 g (ground to a particle size of <1 mm).
Extraction:	Acetonitrile : 1 % phosphoric acid (1:1, v/v).
Cleaning of the extract:	Solid phase extraction (polymeric strong cation exchange).
Detection:	HPLC, gradient elution, reversed phase C18 column, fluorescence detection ext: 245 nm, em: 418 nm
Limits of detection:	5 µg/kg for each alkaloid
Limit of quantification:	10 µg/kg for each alkaloid
Recovery (mean values):	96 to 106 %
Coefficient of variation:	3.2 – 6.9 %.

In figure 1 a typical HPLC chromatogram of a sample extract is shown.

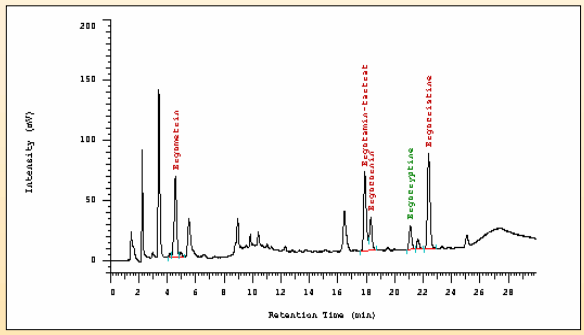


Fig. 1 HPLC chromatogram of an extract of mixed feed

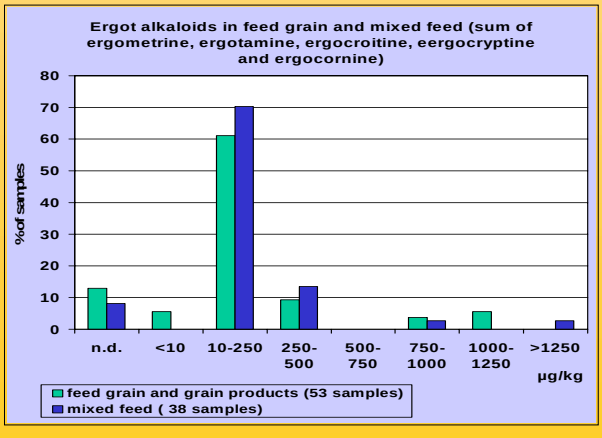
Results and Discussion

Ergot alkaloids were detected in 80 (88 %) from 91 analysed feed samples (53 samples feed grain and 38 samples mixed feed) with amounts from 10 µg/kg to 4883 µg/kg. With the exception of 4883 µg/kg found in a mixed feed for swine all other samples of mixed feed as well as of feed grain showed concentrations below the critical value of 2000 µg/kg ergot alkaloids (calculated regarding the assumed average value of 0.2 % ergot alkaloids and the legal limit of 0.1 % ergot). The results are summarized in Table 1: The median values of ergot alkaloids in mixed feed were comparable to that of feed grain. The comparison of the different types of cereals showed that rye had higher mean and median values than triticale and wheat. The amounts measured were in the predominant part of positive samples between 10-250 µg (61% of feed grain and 73.7 % of mixed feed (Fig.2). Because of the variability of the ergot alkaloid content (depending on different influences, as e.g. the environmental conditions or the fungal strain) is known further investigations are necessary.

Table 1: Results of the analysis of feed on ergot alkaloids (ergotamine, ergometrine, ergocristine, α-ergocryptine and ergocornine)

	Mean value (µg/kg)	Median value (µg/kg)	Sum of ergometrine, ergotamine, ergocristine, α-ergocryptine and ergocornine (µg/kg)	
			Min.	Max.
Mixed feed	269	70	15	4883
Feed grain	212	76	10	1102
thereof Rye	349	106	14	1067
Triticale	175	38	16	1103
Wheat	114	32	10	443

Fig. 2: Distribution of ergot alkaloid contents in mixed feed and feed grain



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