GO‘SHT MAHSULOTLARI TARKIBIDAN ZAMBURUG‘LAR TOMONIDAN ISHLAB CHIQARILGAN MIKOTOKSINLARNI ANIQLASH

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Anotatsiya. Go‘sht mahsulotlarining mikotoksin bilan ifloslanishini aniqlash uchun ushbu mahsulotlarga tegishli bo‘lgan barcha mikotoksinlarning kontsentratsiyasini aniqlash muhim ahamiyatga ega. Ushbu tatqiqot davomida tovuq go‘shti namunalarida mavjud bo‘lgan asosiy mikotoksinlar DON va ZEN miqdoriy ko‘rsatkichlari o‘rganilidi. Olingan natijalarga asosan, go‘sht mahsulotlarining istemolga yaroqliligi o‘rganildi.

Kalit so‘zlar: mikotoksinlar; go‘sht mahsulotlari; ifloslangan ziravorlar; sirt qoliplari; ko‘chirish effekti; nazorat va profilaktika choralari

Аннотация. Для определения контаминации мясных продуктов микотоксинами важно определить концентрацию всех микотоксинов, содержащихся в них. В ходе данного исследования были изучены количественные показатели основных микотоксинов ДОН и ЗЕН, присутствующих в образцах куриного мяса. На основании полученных результатов была изучена пригодность мясных продуктов к употреблению.

Ключевые слова: микотоксины; мясные продукты; контаминированные специи; поверхностные плесени; эффект переноса; меры контроля и профилактики

Annotation. To determine the contamination of meat products with mycotoxins, it is important to determine the concentration of all mycotoxins belonging to these products. During this study, the quantitative indicators of the main mycotoxins DON and ZEN present in chicken meat samples were studied. Based on the results obtained, the suitability of meat products for consumption was studied.

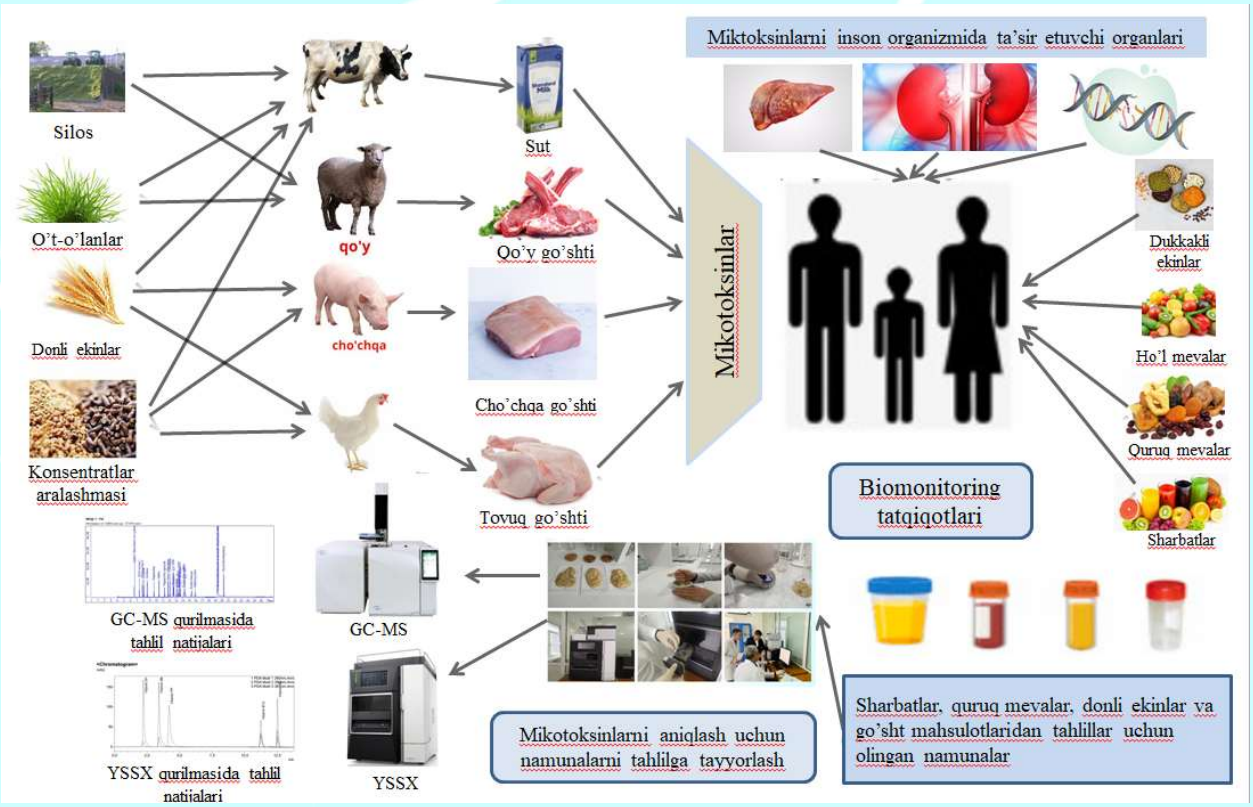
Keywords: mycotoxins; meat products; contaminated spices; surface molds; transfer effect; control and preventive measures

Kirish

Mikotoksinlar odatda, *Aspergillus*, *Fusarium* va *Penicillium* kabi turlar tomonidan ishlab chiqariladi [1]. Sutemizuvchilar, parrandalar bo‘yicha ko‘plab tadqiqotlar shuni ko‘rsatdiki: mikotoksinlar mutagen, gepatotoksik, kanserogen, teratogen, immunosupressiv, nefrotoksik va embriotoksik ta'sirga ega [2]. Global miqyosda aflatoksinlar (AF) oxratoksin A dezoksivalenol va zeralenonlar

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odamlar va hayvonlarning oziq-ovqat mahsulotlarini zararlaydigan eng tibbiy ahamiyatga ega mikotoksinlardir. Saraton bo‘yicha Xalqaro tadqiqot agentligi (IARC) ma'lumotlariga ko‘ra, asosan *A. Flavus* tomonidan ishlab chiqarilgan aflatoksinlar, asosan, gepatotsellyulyar karsinomani keltirib chiqaradigan jigarga ta'sir qiluvchi kanserogen moddalar sifatida tasdiqlangan [3, 4]. Aflatoksinlarni o‘ta yuqori harorat (UHT), qovurish, sterizatsiya, pishirish va sovuq saqlash bilan ularni yo‘q qilish imkonsiz bo‘lib, aflatoksinlar issiqlik va past haroratga chidamli hisoblanadi. AFning ko‘p turlari tabiiy ravishda mavjud bo‘lib, eng kuchli turlari; B_1, B_2, G_1 va G_2 hisoblanadi [5]. Oxratoksin A (OTA) asosan, *Aspergillus* turlari tomonidan ishlab chiqariladigan ikkilamchi metabolitdir, ayniqsa *A. ochraceus*, saqlash sharoitlari bu zamburug‘larning o‘sishi va ko‘payishi uchun tropik va subtropik mintaqalar juda qulaydir [6, 7]. OTA ning asosiy turlari A, B va C bo‘lib, ular inson va hayvonlar salomatligiga jiddiy xavf tug‘diradi [8]. Mikotoksinlar paydo bo‘lishi, migratsiyasi va aniqlash jarayonlari mexanizmini quyida ko‘rishimiz mumkin 1 – rasm.



1–rasm. Mikotoksinlar migratsiyas va uni boshqarish.

Mikotoksin bilan ifloslangan oziq-ovqat va ozuqa iste'moli, o‘z navbatida, inson va hayvonlarning sog‘lig‘iga ta'sir qiladi, chunki ularning o‘ziga xos kanserogenlik va toksiklikni namoyon qiladi [9]. Ko‘pgina mikotoksinlarning kanserogen ta'sirini o‘rganuvchi tadqiqotlar, ayniqsa hayvonlarning ozuqasi va inson oziq-ovqatida keng tarqalgan [10]. Mikotoksinlar ozuqani noto‘g‘ri saqlash paytida yoki noto‘g‘ri saqlangan ozuqa tarkibiy qismlarini kiritish natijasida

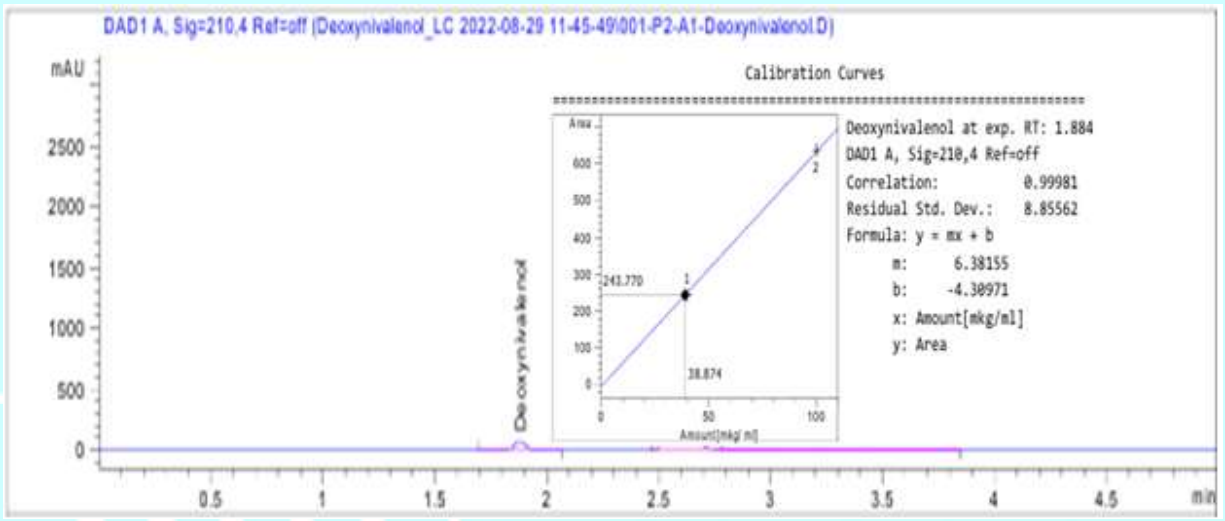
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zamburug‘larning o‘sishi natijasida hayvonlarning ozuqasida paydo bo‘lishi mumkin. 25–40 C issiq ob-havo va yuqori namlik zamburug‘larning rivojlanishi uchun maqul sharoitlardir. Global miqyosda ozuqa va ozuqa tarkibiy qismlari namunalarining 76 foizida kamida bitta mikotoksin aniqlangan va ma’lum miqdorda borligi aniqlangan. Butun dunyo bo‘ylab mikotoksinlarni o‘rganish dasturiga ko‘ra, deoksinivalenol eng ko‘p tarqalgan 57%, fumonisin 55%, zearalenon (38%), aflatoksinlar (27%) va okratoksin A (26%) [11].

MATERIAL VA METODLAR

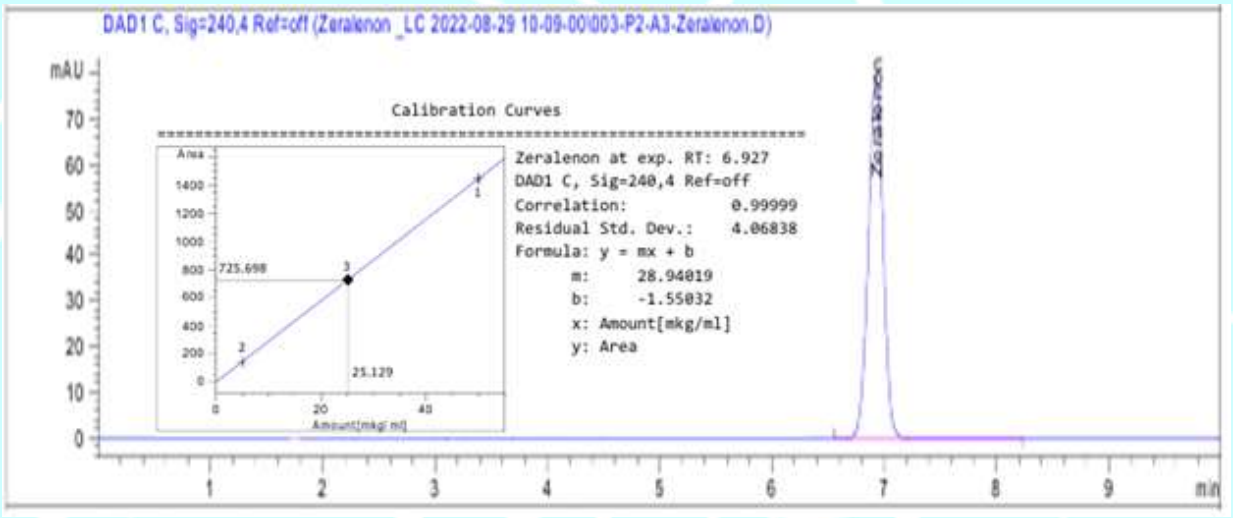
Xromatografik tahlil Agilent 1260 Infinity II Rapid Resolution Liquid tizimida amalga oshiriladi. Nasos G7111A 1260 Quat Pump VL, avtonamuna oluvchi vialsampler G7129A 1260, UV-VIS diodli massiv detektori G7115A 1260 DAD va G7121A 1260 FLD, Chem Station dasturida olib borildi. Eritmalarni yaxshiroq eritish uchun ultratovushli "Guangdong gt ultrasonic" vannasi qo‘llaniladi. HPLC nasosi oqim tezligi 0,8 ml/min, termostat harorati 30°C, DON mobil fazasi; asetonitril/suv 50:50 nisbatda, ZEN mobil fazasi esa 0,8 ml/min da 70:30 nisbatda, ineksiya hajmi 5 mkl, DON 210 nm, ZON esa 240 nmda DAD detektorida, Infinity Lab Poroshel 20 EC-C18 (150 mm x 4,6 mm, 4 mikron (Agilent Technologies AQSH) analitik kalonkasida, “Chemstation” dasturiy ta’minorida bajarildi.

Xromatografiya sharoitlari: termostat harorati 30°C,
DON mobil fazasi (gradiyent); asetonitril/suv 50:50 nisbatda,
ZON mobil fazasi (gradiyent) esa 0,8 ml/min da 70:30 nisbatda,
Ineksiya hajmi; 5 mkl,
Diod matritsali detector; DON 210 nm, ZEN esa 240 nmda DAD detektorida,
Kalonka; Infinity Lab Poroshel 20 EC-C18 (150 mm x 4,6 mm, 4 mikron (Agilent Technologies AQSH) “Chemstation” dasturiy ta’minorida bajarildi. xromatograf - Agilent Technologies 1260 Infinity



1-xromatogramma. Dezoksivalenolning 210 nm da diod matritsali detektorda olingan standanrt namunasi xromatogrammasi

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2-xromatogramma Zeralenon standart namunasining diod matritsali detektorda 240 nm to‘lqin uzunligida olingan xromatogrammasi

2.1–jadval.

Standart namunalar kalibrlanishidan olingan natijalar.

Standart nomi	**Chiziqli diapazon (µg/ml)**	**Regressiya tenglamasi**	***R*** ^{2}
DON	40–100	Formula: y = mx + b m: 6.38155 b: -4.30971 x: Amount [mkg/ml] y: Area	0,99981
ZEN	5-50	Formula: y = mx + b m: 28.94019 b: -1.55032 x: Amount [mkg/ml] y: Area	0,99999

Mikotoksinlar ekstraksiyasi

Ekstraksiya jarayoni ilgari o‘tkazilgan tadqiqotlarga muvofiq amalga oshirildi [12]. Namunalardan 5 g dan olinib yaxshilab maydalanib probirkaga o‘tkazildi. Asetonitril/suv/sirka kislotasining metanoldagi 1 %li eritmasi (40:30:30, v:v:v) solinib yaxshilab chayqatildi. Mikotoksinlar to‘liq ekstraktsiyasini ta'minlash maqsadida 2 g $MgSO_4$ (Sigma-Aldrich) va 0,5 g NaCl 0,75 g PSA bilan yaxshilab aralashtiriladi. So‘ngra ultratovushli suv hammomida, (Guangdong gt ultrasonic) xona haroratida 20 daqiqa davomida mikotoksinlar ekstraksiya amalga oshirildi. Olingan eritma 10 daqiqa davomida 6000 ayl/mln da sentrafuga qilindi va 35^0C haroratda erituvchisi bug‘latilib, qo‘zg‘aluvchan fazada eritildi.

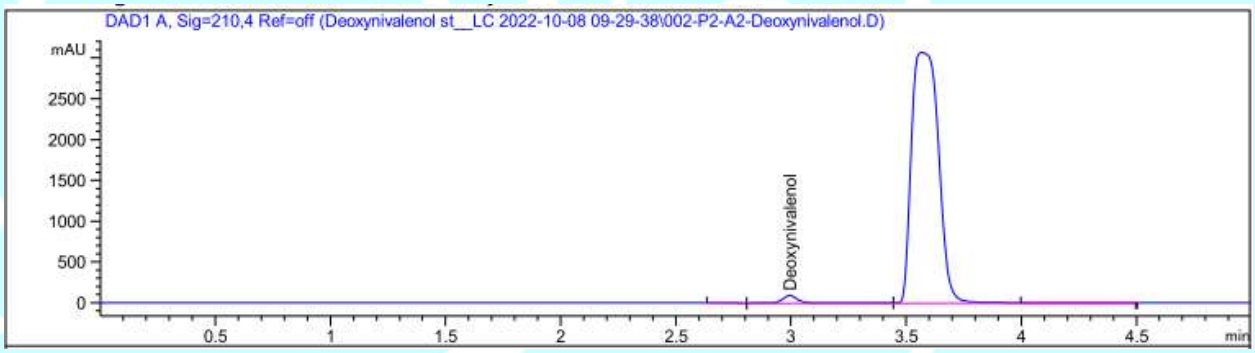
OLINGAN NATIJALAR TAHLILI

Standart namuna sifatida keltirilgan DON va ZEN YSSX metodida kalibrlanishida, korrelyatsiya koeffitsienti 0,99 dan katta bo‘lishini

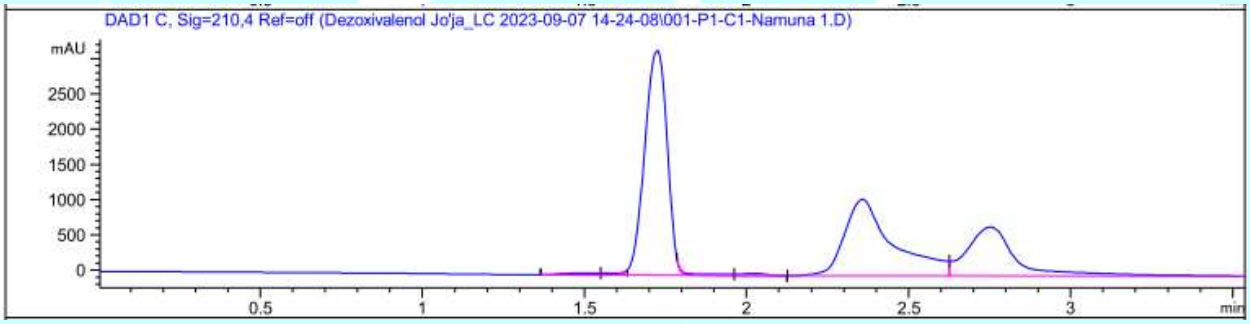
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ta’minlashimiz zarur. Bunda standart namunalar kalibrlash yordamida chizilgan ZEN va DON uchun qabul qilingan standart chiziqlilik va korrelyatsiya koeffitsienti ZON uchun 0,99999 va DON uchun 0,99981 ko‘rsatkichlarni olishga erishildi. ZEN uchun usulning chiziqlilik egrisi standart namunalarida 5,10,20 va 25 µg/ml ning turli to‘rt darajalarida, ZEN uchun miqdoriy chegarasi 20, 40 va 100 µg/ml gacha uch daraja, kalibrlash egri chizig‘i hosil qilindi.

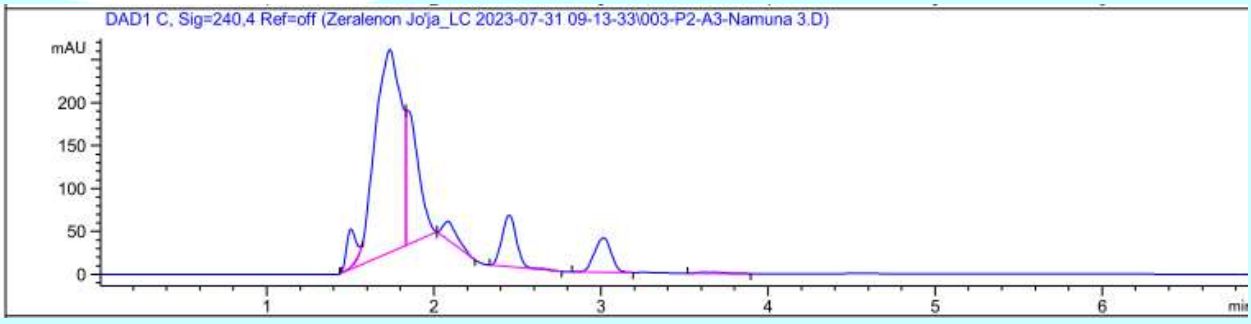
O‘tkazilgan tahlillar asosida quyidagi natijalar olindi.



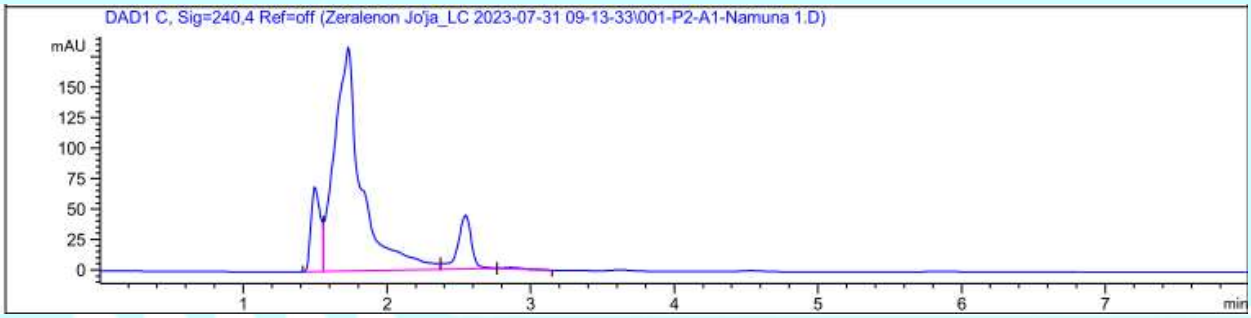
3–xromatogramma. Dezoksivalenol jo‘ja namuna xromatogrammasi



4–xromatogramma. Dezoksivalenol jo‘ja namuna xromatogrammasi



5–xromatogramma. Zeralenon. jo‘ja namuna xromatogrammasi



6–xromatogramma. Zeralenon jo‘ja namuna xromatogrammasi

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Tahlillarda namunalar tarkibidagi DON va ZEN tahlilida ikki tovuq jo‘jalari go‘shtlari tahlil qilindi. Olingan natijalarga asosan, dezoksivalenol miqdori 1 namuna jo‘jada 42,81 mkg/kg miqdori aniqlandi. Tekshirishlar natijasida namunalar tarkibida dezoksivalenol va zeralenon aniqlanmadi. Natijada tahlil uchun olingan ikki jo‘jalar istemol uchun yaroqli ekanligi aniqlandi.

XULOSA

Go‘sht mahsulotlarida ZEN va DON bilan zararlanishi keng tarqalgan bo‘lib, hayvonlar va oziq-ovqat mahsulotlarida tabiiy ravishda uchraydigan beshta eng muhim mikotoksinlardan ikkitasi hisoblanganligi sababli, oziq-ovqat mahsulotlari sifati va xavfsizligini ta'minlash uchun ishonchli va aniq analitik usullar talab qilinadi. Shuning uchun, oddiy va ishonchli bo‘gan yuqori samarali suyuq xromatografiya usulida namunalar tarkibidagi DON va ZEN miqdori tahlil qilindi. Bu xavfsizlik va sifatni ta'minlash dasturlarida iqtisodiy jihatdan foydali bo‘ladi.

FOYDALANILGAN ADABIYOTLAR RO‘YXATI

1. Luo Y, Liu X, Li J. Updating techniques on controlling mycotoxins-a review. Food Control. 2018;89:123–32. https://doi.org/10.1016/j.foodcont.2018.01.016.

2. da Rocha MEB, Freire FCO, Maia FEF, Guedes MIF, Rondina D. Mycotoxins and their effects on human and animal health. Food Control. 2014;36(1):159–65.https://doi.org/10.1016/j.foodcont.2013.08.021.

3. Kurtzman C, Horn B, Hesseltine C.Aspergillus nomius, a new aflatoxin-producing species related to Aspergillus flavus and Aspergillus tamarii. Antonie Van Leeuwenhoek. 1987;53(3):147–58.

4. Al-Jaal BA, Jaganjac M, Barcaru A, Horvatovich P, Latiff A. Aflatoxin, fumonisin, ochratoxin, zearalenone and deoxynivalenol biomarkers in human biological fluids: a systematic literature review, 2001–2018. Food Chem Toxicol. 2019;129:211–28. https://doi.org/10.1016/j.fct.2019.04.047.

5. Shahbazi Y. Aflatoxin M1 contamination in milk and dairy products: implications on human health. In: Nutrients in dairy and their implications on health and disease. Waltham: Academic Press; 2017. p. 237–50.

6. Yeni F, Yavaş S, Alpas H, Soyer Y. Most common foodborne pathogens and mycotoxins on fresh produce: a review of recent outbreaks. Crit Rev Food Sci Nutr. 2016;56(9):1532–44. https://doi.org/10.1080/10408398.2013.777021.

7. Chrevatidis A. Mycotoxins|Occurrence and determination. In: Caballero B, editor. Encyclopedia of food sciences and nutrition. 2nd ed. Oxford: Academic; 2003. p. 4089–96. ISBN 978-0-12-227055-0.

8. Cinar A, Onbaşı E. Mycotoxins: the hidden danger in foods. In: Mycotoxins and food safety: IntechOpen.5 Princes Gate Court, London, SW7 2QJ, UK; 2019

ISSN 3030-3907

9. P.E.Nelson, A.E.Desjardins, R.D.Plattner Fumonisins, mycotoxins produced by fusarium species: Biology, chemistry, and significance Annual Review of Phytopathology, 31 (1993), pp. 233 52.
10. K.De Ruyck, M.De Boevre, I.Huybrechts, S.De Saeger Dietary mycotoxins, co-exposure, and carcinogenesis in humans: Short review Mutation Research: Reviews in Mutation Research, 766 (2015), pp. 32-41.
11. G.R.Murugesan, D.R.Ledoux, K.Naehrer, F.Berthiller, T.J.Applegate, B.T.D.Grenier, Phillips, G.Schatzmayr Prevalence and effects of mycotoxins on poultry health and performance, andrecent development in mycotoxin counteracting strategies Poultry Science, 94 (2015), pp. 1298-1315.
12. S.M.Herzallah Determination of aflatoxins in eggs, milk, meat and meat products using HPLC fluorescent and UV detectors Food Chemistry, 114 (3) (2009), pp. 1141-1146.

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