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Traditional Food Network to improve the transfer of knowledge for innovation

Peter Raspor, Sonja Smole Možina

Bezbednosti i kvalitet šljive i proizvoda od šljive

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UVOD

- Srbija je u 2015. izvezla poljoprivredne i prehrambene proizvode u vrednosti od 2,6 milijardi evra i ostvaren je suficit od 1,2 miliajarde evra, izjavila je ministarka poljoprivrede Snežana Bogosavljević-Bošković. „Taj suficit je u odnosu na suficit u 2014. veći za 22 odsto ako se računa u evrima“,
- http://www.tehnologijahrane.com/iz-novina/srbija-u-2015-ostvarila-izvoz-hrane-vredan-26-milijardi-evra

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Proizvodnja Šljive *UN Food & Agriculture Organization*

	World	11,528,337
1	China	6,100,000
2	Serbia	738,278
3	Romania	512,459
4	Chile	306,354
5	Turkey	305,393
6	Iran	305,262
7	Bosnia and Herzegovina	226,898
8	India	220,000
9	Italy	210,398
10	United States	210,000

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Evolution of food safety management systems

- Good practice-based
  - GHP, GAP, GMP, …
- Hazard-based
  - HACCP
- Risk-based
  - QMRA

- Qualitative, empirical knowledge, prescriptive
  - Prerequisite for all FSMS
- Quantitative (P/A, numbers), control at one step in the food chain
  - Primarily for processes with one major killing step
- Quantitative (consumer risk), applies to the whole food chain
  - Processes with hurdle strategies and/or without major killing steps

Legal and technical basis of QMRA- Quantitative microbial risk assessment in the EU

- 1995 WTO, SPS agreement
- 2000 JEMRA joint FAO/WHO expert meetings on microbiological risk assessment
- 2000 EU White paper on food safety
- 2002 General Food Law, Creation of EFSA

Concerns about Food safety

Fall into 4 categories

- Environmental
- Food and feed safety
- Economic
- Social

Therefore, decision making about is broader than just narrow safety

Risk assessment methodology

1. Identify potential risk
2. Identify adverse effect that could result
3. Estimate the likelihood of the adverse effect being realised
4. Evaluate the consequences if the risk is realised
5. Consider risk management strategies
6. Estimate the overall potential impact

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Izazovi svježih proizvoda

- Inoculum **remains all the way** from the farm to the fork
- Usually **eaten raw** – no pathogen killing step
- Farmers, retailers and consumers require **training**

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Skroz od njive do trpeze

- Field- polje
- Harvest- berba
- Handling- rukovanje
- Processing- prerada
- Distribution
- Storage
- Retail
- Use areas (street, kitchen, serving etc)

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Commodities of concern

- **Category I:** Leafy vegetables
- **Category II:** Fresh fruits, fresh onions, melon, sprouts and tomatoes
- **Category III:** Carrot, cucumber, almonds, baby corn, sesame seeds, onion, garlic, mango, celery

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Pathogens of concern

- Large epiphytic numbers
- **Pathogens**
  - *Salmonella*
  - *E. coli* O157:H7
  - *Listeria monocytogenes*
  - Viruses (Noroviruses, Hepatitis A)
  - Protozoa (*Cryptosporidium, Cyclospora, Giardia*)

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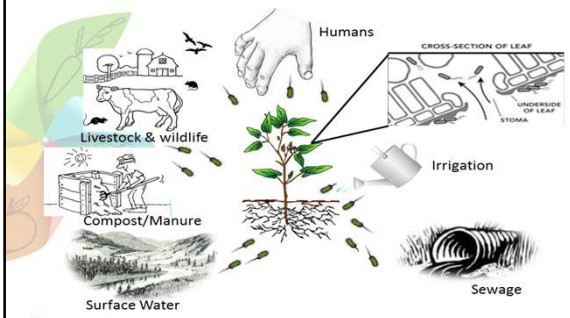
Mogući putevi kontaminacije u biljnoj proizvodnji sa ljudskim patogenima (Tsaltas, 2015)



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Stoka i divljač

- Livestock should be **kept away** from **crop** and **water** sources
- Create **buffer zones**
- Daily **inspections**
- Wildlife **control** (mice/rats, reptiles, amphibians, birds, insects)

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Ljudski faktor
Radnici → "food handlers")

- **Workers hands:** Biggest source of pathogens
- Washing hands
- Wearing gloves
- Monitor sicknesses
- Offer personal hygiene facilities (toilet, sink)
- Clean Clothing (uniform, hat, shoes)
- Potable water
- Training
  - Personal hygiene
  - Contamination
  - Role of pathogens

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Kompost / gnojivo/ đubrivo

- Well composted (matured)
- Application no later 120 days before harvest or well prior to edible parts emergence
- Appropriately stored
  - Care for water sources contamination

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Voda: Navodnjavanje, prskanje „cidima“ i Pranje

- General
  - Water in contact with produce – Need to be clean
- Irrigation/Spraying
  - Drip irrigation (preferred)
  - Spraying: potable quality
  - More care for surface water
  - Ground water and septic tanks
  - Treatment by herbicides, pesticides,
- Wash
  - Potable and desinficiens
- Hygiene & Drinking
  - Potable

Savladavnje rizika

- HACCP application not always feasible
  - Difficult to identify Critical Control Points
- Good Agricultural and Hygienic Practices (USA)
- Regulation EC852/2004 & national legislations
- Thorough Management Risk
  - Via **traceability** systems
  - Via recall procedures (very difficult)

Uredba -Tehničke tačke

- Staff training in food safety and hygiene issues
- Staff inspections for same issues
- Personal hygiene
  - Acceptance of need
  - Keep high levels of personal hygiene
  - Use of proper clothing and protective gear (gloves, goggles, mask etc)
- High quality water (when needed)

Glavne tačke dobre poljoprivredne prakse GAPs

- Water quality
- Manure, slurry, sludge and composts application
- Workers health and hygiene
- Hygienic facilities
- Hygiene and tidiness of farm
- Hygiene and tidiness of packaging areas
- Transport
- Traceability of farm practices and operations

NEGATIVNO DELOVANJE MIKROBA U PROCESIMA

- Definicija pojmova kontaminenti, tehnološki kvarljivci, patogeni mikrobi (bakterije, plesni, kvasci, virusi).
- Podela Mikroba s obzirom na stepen rizika za konačnog potrošača.
- Trovanje zbog mikrobne kontaminacije i trovanje produktima mikrobnog delovanja.
- Tehnološki kvarljivci i tipični procesi kvarenja hrane.
- Tehnologija proizvodnje - mikrobiološko procesni aspekt.

NEGATIVNO DELOVANJE MIKROBA U PROCESIMA

- Opredeljenje roda i vrste s obzirom na kvar i njihova funkcija u tehnologiji i način dokazivanja prisutnosti *Acetobacter, Bacillus, Lactobacillus, Lactococcus, Leuconostoc, Micrococcus, Pediococcus, Pseudomonas Aspergillus, Botritis, Fusarium, Geotrichum, Monillia, Penicillium, Rhyzopus, Brettanomyces, Candida, Debaryomyces, Kluyveromyces, Pichia, Rhodothorula, Saccharomyces, Zygosaccharomyces*
- Štetni produkti razgradnje za kvalitet prehrambenih proizvoda.

KVARENJE HRANE

- je svaka promena u stanju hrane, koja uzrokuje njenu manju privlačnost i kvalitet ali nije nužno, da je takođe i zdravstveno neispravna. Ovakve promene uključuju pored ukusa i miris, izgled i teksturu te predstavljaju najozbiljniji problem u prehrambenoj industriji (senzorno- organoleptičke promene). Moramo razlikovati kvarljivce (kvarne mikrobe, procese) i patogene mikrobe,
- Kvarljivi mikrobi su po pravilu gljive i bakterije, a patogeni mikrobi mogu biti iz istih grupa ali oni po pravilu ne menjaju senzorne karakteristike hrane.

Štetni mikrobi za potrošača

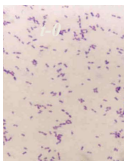
- **Trovanje hranom,**
- **I. grupa mikroba- infekcije!**
- **II. grupa mikroba- toksikoinfekcije,**
- **III. grupa mikroba- alimentarne intoksikacije.**

Normalna Mikrobna Flora probavnog trakta

- usta
  - 1 ml slina = millions of bacteria
- Želudac i malo crevo
  - Nekoliko organizma prezive tretma s HCl
- Debelo crevo
  - 100 miljardi bakterija na gram feseca
  - 40 % fekalne mase je mikrobni material
    - *Lactobacillus, Bacteriodes, Enterobacter, E. coli. Proteus spp.*

Zašto vidimo mikrobe kao glavni hazard?

Jer se umnožavaju!



Biološki agensi koji uzrokuju bolest

- PATOGENE BAKTERIJE (Cca.20 sp)
- PARAZITI (CCA 10)
- VIRUSI (5 groupa)
- PRIRODNI TOKSINI (10 groupa
- PRIONI (Bovina Spongiformna Encefalopatija (BSE)-TSE

BRIGE O BEZBEDNOSTI HRANE

Prirodni toksini

Biljni toksini
cianogeni toksini

Mikrobni toksini
Bakterijski i plesni

Zagađuju širok spektar hrane i izazivaju mnoge bolesti- mycotoxicose **– Izazivaju akutne ili hronične bolesti. Organi koje napadaju su jetra i bubrezi.**
Mikotoksini predstavljaju veliku opasnost za ljude, s obzirom na dugoročne kancerogene efekte: Akutni beri beri, nefropatije (Balkanska endemična nefropatija, svinjska nefropatija, drhtavica, neurološki poremećaji, rak, tumori, oštećenja jetre i bubrega (nekroza bubrega, tumori na bubrezima), izliv krvi u plućima i mozgu, ili čak smrt.

Primarne zoonotički paraziti povezani sa hranom (Slifko et al. (2000) Int. J. Parasitol. 30: 1379-1393)

Parazit	Prenos hranom (%)
Microsporidia	ND
Cyclospora cayetanensis	ND
Giardia duodenalis	10
Cryptosporidium parvum	10
Toxoplasma gondii	50
Trichinella spiralis	100
Taenia solium/T. saginata	100
Anisakis simplex	100

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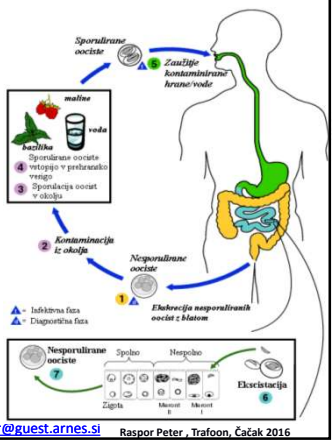
Primer

- *Entamoeba histolytica, Giardia lamblia, Cryptosporidium parvum* and *Cyclospora cayentanensis*.



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Paraziti, Protozoe i Gliste

Data collected from 1983-1997. Mead et al. (1999) Emerg. Inf. Dis. 5: 607-625 for USA

Agent	Bolest (%)	Bolnica (%)	Smrt (%)
Viral	67.2	34.8	7.1
Bacterial	30.2	59.9	71.7
Parasitic	2.6	5.3	21.2

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Novi patogeni mikrobi u hrani

- Oportunisti- patogeni koji su ušli u nove kanale u tehnologiji i prehrambenom lancu
- Primer Listeria i Yersinia

listerioza

yesionioza;

Fruit Recalled for Potential Listeria Contamination, Wegmans Recalls Fruit Desserts By News Desk | July 22, 2014

Update: Recall driven by 'trace amounts' of bacteria detected in Australia, fruit shipped internationally

http://www.foodsafetynews.com/2014/07/peaches-nectarines-plums-and-pluots-recalled-for-listeria-potential/#.VrjDDo-cGUk

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Šljiva može biti kontaminirana:

- contact with (human) faeces or faecally contaminated water
- contact with faecally soiled materials (including hands)
- contact with vomit or water contaminated with vomit
- contact with environments in which infected people were present, even if the surface was not directly contaminated with stool or vomit
- aerosols generated by infected people

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Izvor kontaminacije- voda

- sewage contaminated water
- contaminated drinking /irrigation water
- groundwater
- urban rivers

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Izvor kontaminacija – prpremljena hrana

- dishes containing fresh (or fresh frozen) fruits and vegetables
- bakery products,
- ice cubes

SPREČAVANJE KONTAMINACIJE u lancu prerade šljiva

- **GENERAL RECOMMENDATIONS**
- Food business operators should ensure that all appropriate good hygienic practices are being followed and HACCP systems are in place.
- Training in food hygiene is essential and should be performed regularly. This must include training on good hygiene for temporary/seasonal staff.
- Training should be documented and verifiable.
- The food business operator should ensure that good sanitary practices are being followed, for example by effective supervision and verification through random inspections.

SPREČAVANJE KONTAMINACIJE

Contamination vehicles	Potential contamination points:
Food handlers' hands	Manual picking and handling plums
Untreated Water	Spray irrigation
	Spraying pesticide and/or fertilizer
Untreated manure	Contact with plums on the graund
Unclean harvesting equipment and utensils	Contact with plams

Proizvodi od šljive

Kuvani/ pasterizacija
- 1) „džem“;
- 2) „ekstra džem“;
- 3) „žele“;
- 4) „ekstra žele“;
- 5) „marmelada“;
- 6) „žele marmelada“;
- 7) „domaća marmelada“;
- 8) “pekmez“

Sušeni
- 9) „suve šljive“;

Sveži
- 10) „sveža šljiva “;
- 11) „smrznuta šljiva“;
- 12) „sveži ili pasterizovani sok od šljive“;

Fermetirani
- 13) vino od šljive

Destilati
- 14 „šljivovica“;

Food Quality/ Safety Index

Proizvod mora biti mikrobiološki ispravan bez patogenih mikroba i mikotoksina i ne sme sadržati ostatke pesticida , teških metala i ostalih toksičnih supstanci štetnih po zdravlje ljudi.

Vodič za primenu mikrobioloških kriterijuma za hranu

Ministarstvo poljoprivrede, šumarstva i vodoprivrede Republike Srbije je izdalo u kojem su definisane sledeće mikrobiološke analize gotovog proizvoda.

Mikroorganizam	Plan kontrole		Granična vrednost	
	n	c	m	M
Enterobacteriaceae	5	1	10 cfu/g	100 cfu/g

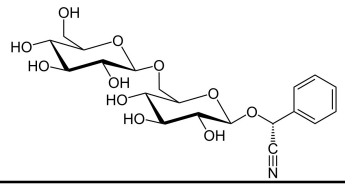
Na osnovu vodiča potrebno je uzeti pet uzoraka gotovog proizvoda **(n)**.

U slučaju Enterobacteriaceae dozvoljeni broj kolonija mikroorganizama u jednom uzorku **(c)** je između 10 cfu/g **(m)** i 100cfu/g **(M)**, ali ni u jednom slučaju broj ne sme biti veći od 100 cfu/g.

Samo ukoliko se analizom utvrde zahtevane vrednosti, proizvod se smatra mikrobiološki ispravnim.

Prirodni toksini

- **Amygdalin** (from Ancient Greek: ἀμυγδαλή *amygdálē* "almond"), is a poisonous cyanogenic glycoside found in many plants, but most notably in the seeds (kernels) of apricot, peach, and plum.



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Cianoglikozidi

Food	cyanogenic glycoside present	Cyanogen content (mg HCN/kg)
Plum (*Prunus* spp.) Kernel	Amygdalin	696-764

- Potential toxicity of cyanoglycosides arises from enzymatic degradation to produce **hydrogen cyanide,** resulting in **acute cyanide poisoning**. The enzyme responsible (β-glucosidase) may arise from the plant material or from gut mcroflora.

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Cianoglikozidi

- Clinical symptoms of acute cyanide poisoning include rapid respiration, drop in blood pressure, rapid pulse, headache, dizziness, vomiting, diarrhoea, mental confusion, stupor, blue discolouration of the skin due to lack of oxygen (cyanosis), twitching and convulsions.
- Cyanide can be lethal to humans and the acute dose is in the region of 1 mg/kg body weight.

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Cianoglikozidi

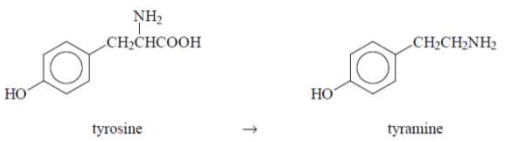
- Maximum Level Total hydrocyanic acid:
- Confectionery 25 mg/kg
- Stone fruit drinks 5 mg/kg
- Marzipan 50 mg/kg
- Alcoholic beverages 1 mg/kg per 1% alcohol content

Amini v šljivah/ proizvodih od šljive

- Halasz A. *et al*. (1994) have reported high amine levels in plum (**tyramine, noradrenaline**)
- Amine build-up usually results from decarboxylation of free amino acid by enzymes of bacterial origin. Amino acid decarboxylation takes place by removal of the a-carboxyl group to give thecorresponding amine.
- **Tyramine, tryptamine and b-phenylethylamine** come by the same manner from tyrosine, tryptophan and phenylalanine, respectively.
- Proteolysis, either **autolytic or bacterial**, may play a significant role in the release of free amino acids from tissue proteins which offer a substrate for decarboxylases reactions

Amini v šljivah/ proizvodih od šljive

- FRESH FRUIT, JUICES
- WINE AND FRUIT WINES



Amini v šljivah/ proizvodih od šljive

The variability in biogenic amines contents could be explained on the basis of differences in:
- type of **soil** (Baucom T.L. *et al.,* 1986);
- variety (Zee J. *et al.,* 1983 and degree of maturation of the grape (Ough C.S., 1971);
- **raw material** quality (Onal A., 2007); USE OF PECTOLYTIC ENZYMES/ LACK OF HYGIENE
- **precursor free amino acids** (Cerutti G. *et al.,* 1978; Soufleros E. *et al*., 1998);
- **contact time of must and marcs** (Ough C.S., 1971); DURATION OF MACERATION
- **action of yeast / bacteria in alcoholic fermentation** (Vidal-Carou M.C. *et al.,* 1990b;
- **alcohol content** (Landete J.M. *et al.,* 2004; Vidal-Carou M.C. *et al.,* 1990b);
- **sulfur dioxide concentration** (Rivas-Gonzalo J.C. *et al.*, 1983);
- **added nutrients** (Gloria M.B.A. *et al.,* 1998);
- **pH** (Ferrer S. and Pardo I., 2005);
- **quantity and type of fining agents** (Jakob L., 1968;
- **action of lactic acid bacteria in the malolactic fermentation** (Delfini C., 1989;

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Mycotoxin risks and toxigenic fungi in date, prune and dried apricot among Mediterranean crops OZER et al, *Phytopathologia Mediterranea* (2012) 51, 1, 148–157

Table 1. Mycotoxigenic fungi in dried apricots, prunes and dates in Mediterranean crops.

Sample	No. of samples	Fungi	Contaminated samples[a] (%)	Reference
Dried apricot	14	None	0	Iamanaka *et al.*, 2005
Dried apricot	1	*P. chrysogenum*	100	Zohri and Abdel-Gawad, 1993
Date	22	*A. niger*	1.5	Iamanaka *et al.*, 2005
Date	25	*A. flavus*	50	Shenasi *et al.*, 2002
Date	10	*A. niger*	NI	Hasnaoui *et al.*, 2010
Date (from different production stage of packing)	40	*Aspergillus* spp. (*A. niger*, *A. flavus*, *A. ochraceus*)	100	Ragab *et al.*, 2001
		P. chrysogenum	NI	
Date	60[b]	*Aspergillus* spp. (*A. niger*, *A. flavus*)	100	Abdel-Sater and Saber, 1999
Prune	21	*A. niger*	8	Iamanaka *et al.*, 2005
		A. ochraceus	0.5	
Prune	1	*P. chrysogenum*	100	Zohri and Abdel-Gawad, 1993

[a]NI, No information.
[b]Total number of dried fruits.

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Mycotoxin risks and toxigenic fungi in date, prune and dried apricot among Mediterranean crops OZER et al, *Phytopathologia Mediterranea* (2012) 51, 1, 148–157

- Mycotoxins, formed by certain filamentous fungi belonging to the genera *Aspergillus, Penicillium, Alternaria* are the major contributors of fruit spoilage and mycotoxin production in fruits (Barkai-Golan, 2008).
- Although a large number of different mycotoxins exist, only a few of them, namely **patulin, aflatoxins(AFs), ochratoxin A (OTA) and Alternaria toxins a**re frequently found in fruit and fruit products (Drusch and Ragab, 2003

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Mycotoxin risks and toxigenic fungi in date, prune and dried apricot among Mediterranean crops OZER et al, *Phytopathologia Mediterranea* (2012) 51, 1, 148–157

- AFs, produced by members of *Aspergillus* section *Flavi* (mainly *Aspergillus flavus* and *A. parasiticus),* are potent hepatotoxic, mutagenic and carcinogenic toxins causing serious health hazards to humans and animals.

Mycotoxin risks and toxigenic fungi in date, prune and dried apricot among Mediterranean crops OZER et al, *Phytopathologia Mediterranea* (2012) 51, 1, 148–157

- OTA is a mycotoxin produced by several fungal species belonging in *Aspergillus* sections *Circumdati*, *Flavi* and *Nigri* and by *Penicillium verrucosum* and *P. nordicum*.
- OTA is a potent nephrotoxic and hepatocarcinogenic mycotoxin that primarily affects the kidneys in animals and has been associated with Balkan Endemic Nephropathy and urethelial tumors in humans. OTA is classified as a possible human carcinogen (group 2B) by the International Agency for Research on Cancer (IARC, 1993).

Mycotoxin risks and toxigenic fungi in date, prune and dried apricot among Mediterranean crops OZER et al, *Phytopathologia Mediterranea*

Table 2. Mycotoxins in dried apricots, prunes and dates in Mediterranean crops.

Sample	No. of samples[a]	Type of mycotoxin	No. (and %) of contaminated samples[a]	Mycotoxin level[b] (μg kg^{-1})	Reference
Dried apricot	3	Ochratoxin A	3 (100)	50–110	Zohri and Abdel-Gawad, 1993
		Aflatoxins, citrinin, patulin, sterigmatocystin, T-2 and zearelanone	0	ND	
Dried apricot (treated or untreated with SO_2 before drying	150	Ochratoxin A	0	ND	Akcoy *et al.*, 1995
		Total aflatoxins	0	ND	
Apricot dried on soil	NI	Aflatoxin B_1	NI	1.47	Celik and Ozturk, 2000
		Aflatoxin G_1	NI	1.11	
Apricot dried on tarp	NI	Aflatoxin B_1	NI	0.85	
		Aflatoxin G_1	NI	1.27	
Apricot untreated with SO_2	NI	Aflatoxin B_1	NI	0.16	
		Aflatoxin G_1	NI	0.35	
Apricot untreated with SO_2 + stored for 1 year	NI	Aflatoxin B_1	NI	0.10	
		Aflatoxin G_1	0	ND	
Dried apricot	15	Aflatoxin B_1	3 (20)	1.44	Gunsen and Buyukyoruk, 2002
Dried apricot	14	Ochratoxin A	0	ND	Iamanaka *et al.*, 2005
Dried apricot	2	Zearalenone	0	ND	Munaiger *et al.*, 2008
		Total aflatoxins	0	ND	
Dried apricot	20	Ochratoxin A	1 (5)	0.97	Bircan, 2009
Date	60	Aflatoxin B_1	2 (3.3)	300–390	
		Ochratoxin A	2 (3.3)	360–450	
		Zearalenone	3 (5)	500–1000	
Dates(raw, fumigated, dried, paste, stuffed with peanut, stuffed with almond)	40	Aflatoxin B_1	2 (out of 5 pitted date fruits stuffed with peanut)	4.8–6.2	Ragab *et al.*, 2001
Date	20	Aflatoxin B_1	2 (10)	110–180	Alghalibi and Shater, 2004
Date	20	Ochratoxin A	2 (10)	0.1–5	Iamanaka *et al.*, 2005
Prune	3	Ochratoxin A	3 (100)	210–280	Zohri and Abdel-Gawad, 1993
		Aflatoxins, citrinin, patulin, sterigmatocystin, T-2 and zearelanone	0	ND	
Prune	31	Ochratoxin A	26 (84)	max. 0.07	Engel, 2000
Prune	21	Ochratoxin A	1 (4.8)	0.1–5	Iamanaka *et al.*, 2005

Prune (suve šljive)

- Studies performed on mycotoxin contamination of prunes indicate that OTA formation is the major mycotoxin problem in these fruits.
- OTA contamination of prunes has been examined in a few countries in the Mediterranean Region. Zohri and Abdel-Gawad (1993) performed a study on OTA, AFs, citrinin, patulin, sterigmatocystin, T-2 and zearelanone contamination of three samples of dried plums and only **OTA was found in the range of 210–280 µg kg-1 in all analyzed samples**.
- On the other hand Iamanaka et al. (2005) analyzed 21 samples of dried plums and **only one sample was contamined with OTA in the range of 0.1–5 µg kg-1**. Similar to the previous study, Engel (2000) reported a **maximum of 0.07 µg kg-1 OTA content in 26 out of 31** prune samples. The natural occurence of AFB1 has also been reported in prunes (Apergi and Panagiotopoulou, 1998).

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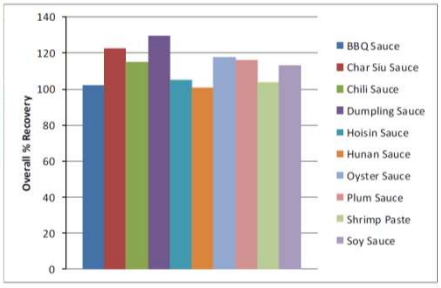
Quantitation of Aflatoxin B1 by ELISA in Commodities that Pose a Matrix Effect by Thu Hyun etr al AOAC 2012

Figure 4 - Overall % recovery of aflatoxin B_1 from cooking sauces



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Šljivovica- Metanol

- **Factors Affecting the Methanol Content and Yield of Plum Brandy**
- Hui Zhang, Edward E. Woodams andYong D. Hang
- **Abstract**
- methanol content and the yield of plum brandy. Seven plum cultivars (Geneva Mirabelle, French Damson, Pozegaca, Oblinaya, Early Golden, Lohr, and Rosy Gage)
- Finger Lakes fruit region of New York
- The fermented samples were distilled, and the distillates were analyzed for methanol, ethanol, and higher alcohols by high-performance liquid chromatography. Duncan's multiple range tests show significant differences in the methanol content and the yield of plum brandy made from 7 plum cultivars. **The harvest year also had a significant effect on the methanol content and the yield of plum brandy**. Student's t-test results indicate that plum juices gave a lower methanol content of brandy than plum mashes without significantly reducing the brandy yield.

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Šljivovica- ethyl carbamate, and methanol

- J Agric Food Chem. 2005 Oct 19;53(21):8230-8.
- **Effect of the stone content on the quality of plum and cherry spirits produced from mash fermentations with commercial and laboratory yeast strains.**
- Schehl B[1], Lachenmeier D, Senn T, Heinisch JJ.

- To evaluate the influence of stone content on spirit quality from stone fruit, cherry and plum mashes were prepared and fermented with a commercial and a diploid laboratory yeast strain. Fermentation parameters such as sugar content and ethanol production were followed. Despite an initial lag phase in cherry spirits, both yeast strains performed similarly, as substantiated by the determination of specific flavor compounds, ethyl carbamate, and methanol in the mashes and after distillation. The spirits produced were subjected to sensory analyses by trained panels of at least 25 judges. Although mashes retaining the stones could be clearly distinguished from those where the stones had been removed, no significant preference could be attributed to either spirit, indicating that qualities added by the presence of stones during fermentation are largely a matter of personal taste. Interestingly, the yeast strain used for fermentation seemed to have little influence on the spirit quality.

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Efikasno procesiranje hrane

- Pasterizacija
- Fermentacja
- Dehidracija
- Hlađenje
- Smrzavanje

- I brojni moderni postupci
- zračenje
- Visoki pritisak
- Svetlost...

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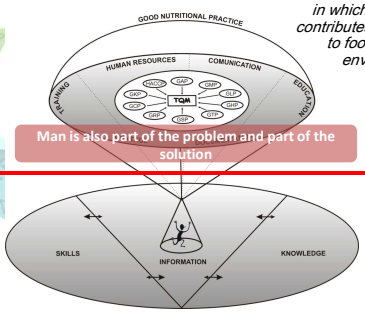
Ljudski faktor

Human behavior regardless of the sanitary environment in which they work, still contributes the greatest risk to food processing environments.



Food safety platform: balanced model for ensuring food safety from Good Nutritional Practice viewpoint

Raspor P, Jevšnik M. 2008. Good nutritional practice from producer to consumer. Critical Reviews in Food Science

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Zaključak

Pojava bolesti-outbreaks- povezani s šljivom sugerišu da je to sporadično

Diskarpanca tačka prodaje i pojava bolesti – sugeriše da ima malo direktnih kontaminacije preko šljive

Danas industraja još uvek računa na intervencije poslje berbe

Regulatori traže HACCP strategiju da se spreči kontaminacija

Prevencija od kontaminacije se preferira i proizvađači moraju slediti GAP, GMP i GHP te sledljivost

Kad se pogleda stvarnosti u oći - ima još puno mogućnosti da se uradi bolje

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Irradiation for Mold and Mycotoxin Control, Thalita Calado, Armando Venˆancio, and Lu´ıs Abrunhosa, 2014, omprehensive Reviews in Food Science and Food Safety 1049-1061

- The mycotoxin issue requires constant vigilance from economic, regulatory, and scientific agents to minimize its toxicological effects on human and animals.
- The implementation of good practices to avoid fungal growth and mycotoxin production on agricultural commodities is essential to achieve most restrictive safety standards; however, the contribution of novel technologies that may act on postharvesting and poststorage situations may be equally important.
- Several methodologies, more or less technologically advanced, may be used for this purpose like irradiation technology to control the presence of fungi and mycotoxins in food and in feed.

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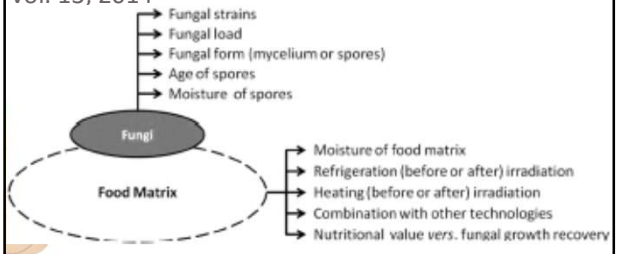
Factors that may influence the effectiveness of the spore irradiation process in food, Calado et al. CRC Vol. 13, 2014



Irradiation for Mold and Mycotoxin Control, Thalita Calado, Armando Venˆancio, and Lu´ıs Abrunhosa, 2014, omprehensive Reviews in Food Science and Food Safety 1049-1061

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Zaključci CRC clanka

- The radiolytic process is influenced by many factors, such as absorbed doses, initial mycotoxin concentration or fungal load, the position in the irradiated system, the amount of moisture, and/or the presence of other matrix components.
- Radiosensitivity of fungi also depends on strain characteris-tics, mold forms (mycelium or spores), the moisture content of spores or commodities, spore age, commodity character-istics, the existence of periods of refrigeration or of heating before or after treatments, and on the combinations of radiation with other technologies. **Fungi with melanized mycelia and spores are also more radioresistant than other structures. Commodities with higher moisture content may favor fungal recovery after irradiation if inactivation is not complete.**

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- The fungal load may be substantially reduced with irradiation levels of 5 kGy and above; however, lower radiation doses can also be effective if products are previously treated with hot water.
- Irradiated fungal strains can occasionally produce more my-cotoxins than original strains; however, appropriate storage after irradiation can minimize the development of remaining fungal propagules.
- Dried mycotoxins are extremely radioresistant, whereas in solution, mycotoxins are sensitive to irradiation. The oxidative radicals that originate from water radiolysis are responsible for their degradation.

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- Combining gamma-irradiation with other treatments can im-prove the breakdown of mycotoxins (for example, using hydrogen peroxide, ammonium bicarbonate, or higher moisture conditions).
- Generally, more than 10-kGy doses are required to eliminate a significant amount of mycotoxins in food matrixes.
- Patulin is an exception because patulin can be completely destroyed in apple juice by radiation doses between 2.5 and 5 kGy. The loss of toxicity after irradiation was only demonstrated for AFB1.

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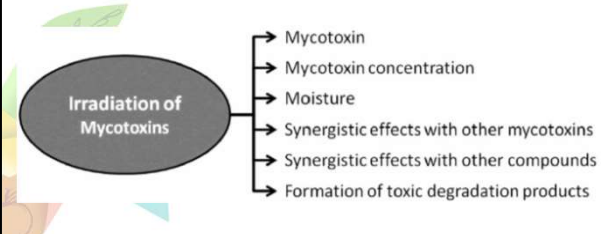
Factors that may influence the effectiveness of the mycotoxin irradiation process.



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- http://www.overa.rs/pravilnik-o-kvalitetu-vocnih-dzemova-zelea-marmelade-pekmeza-i-zasladenog-kesten-pirea.html
- **Pravilnik o kvalitetu voćnih sokova, koncentrisanih voćnih sokova, voćnih sokova u prahu, voćnih nektara i srodnih proizvoda**
- ("Sl. glasnik RS", br. 27/2010, 67/2010, 70/2010 – ispr., 44/2011 i 77/2011)
- „Pravilnik o kvalitetu proizvoda od voća, povrća i pečurki i pektinskih preparata", (Sl. list SFRJ br. 1/79 , Sl. list RS 43/2013)
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- Pravilnik o kvalitetu proizvoda od voća, povrća i pečurki i pektinskih preparata
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- http://www.tehnologijahrane.com/pravilnik/pravilnik-o-kvalitetu-proizvoda-od-voca-i

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- Retired professor of Microbiology and Food safety at Faculty of Health Scienecs at University of Primorska 2014-2016
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