DEVELOPMENT OF TECHNOLOGICAL PARAMETERS FOR REDUCING THE CONTENT OF CARBOPHOS IN MILK

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The article presents the results of a study on the migration process along the food chain of organophosphate pesticides into livestock products. There are isolated works of domestic and Russian scientists devoted to the study of the content of the residual amount of this xenobiotic in animal meat. In agriculture, various insecticide chemicals are used to increase yields, which have high toxic properties. If the rules for the use of pesticides in agriculture are violated, there is a threat of these substances entering food in an amount exceeding the maximum permissible concentration of these substances. In this regard, scientific research aimed at removing pesticide residues from environmental objects, raw materials of animal and plant origin, food products using natural zeolites is an urgent direction.

To remove the organophosphate pesticide, we used natural zeolite. The adsorption properties of zeolite in relation to the pesticide were investigated in comparison with activated carbon.

In this regard, the most promising direction of reducing the content of pesticides in environmental objects, in raw materials of plant and animal origin and in food products is the use of zeolites as an adsorbent.

Key words: *milk, carbophos, zeolite, organophosphate pesticides, xenobiotic.*

СҮТТІҢ КАРБОФОС ҚҰРАМЫН АЗАЙТУ ТЕХНОЛОГИЯЛЫҚ ПАРАМЕТРЛЕРІН ӘЗІРЛЕУ

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Мақалада мал шаруашылығында фосфорорганикалық пестицидтердің қоректік тізбегі бойынша көшу процесін зерттеу кезіндегі зерттеу қортындылары келтірілген. Жануарлардың етіндегі осы ксенобиотиктің қалдық мөлшерін зерттеуге арналған отандық және ресейлік ғалымдардың бірнеше жұмыстары белгілі. Ауыл шаруашылығында өнімділікті арттыру үшін жоғары уытты қасиеттері бар, химиялық заттар-инсектицидтер қолданылады. Ауыл шаруашылығында пестицидтерді қолдану қағидалары бұзылған кезде осы заттардың рұқсат етілген шекті концентрациясынан асатын мөлшерде тамақ өнімдеріне түсу қаупі туындайды. Осыған байланысты табиғи цеолиттерді пайдалана отырып, қоршаған орта объектілерінен, жануарлар мен өсімдіктер шикізаттарынан, тамақ өнімдерінен пестицидтердің қалдықтарын жоюға бағытталған ғылыми зерттеулер өзекті бағыт болып табылады.

Фосфорорганикалық пестицидті кетіру үшін біз табиғи цеолит қолдандық. Цеолиттің пестицидке қатысты адсорбциялық қасиеттері белсендірілген көмірмен салыстыра отырып зерттелді.

Осыған байланысты қоршаған орта объектілеріндегі, өсімдік және жануарлардан алынатын шикізаттардағы және тамақ өнімдеріндегі пестицидтердің құрамын төмендетудің ең перспективалы бағыты адсорбент ретінде цеолиттерді пайдалану болып табылады.

Түйін сөздер: *сүт, карбофос, цеолит, фосфорорганикалық пестицидтер, ксенобиотик.*

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DEVELOPMENT OF A COMBINED PRODUCT FROM HORSE MEAT AND CHICKEN WITH SPROUTED GREEN BUCKWHEAT USING THE PRINCIPLES OF HACCP

Annotation: *This study was specifically designed for a small-scale meat processing enterprise "DARIYA" to set up a specific HACCP plan for the new product (patties) made from mixed horsemeat with vegetable components developed in the Department of Technology of Food Production and Biotechnology, Shakarim University of Semey. Critical control points (CCPs) were identified and applied in the HACCP plan. The different hazards were detected at each processing*

step, whereas each CCP in the HACCP plan was identified and accompanied with the appropriate significant hazard, critical limit, monitoring of the CCP, and corrective actions, confirming that the enterprise has fully employed the HACCP methodology. The rapid screening of the bacterial count, heavy metals, pesticide residue, and physical contamination levels also improved monitoring assertiveness, allowing them to deal with foreseeable issues linking to resources and guarantee product quality. Cesium-137 was recorded as 5.4 ± 2.9627 Bq/kg in horsemeat and 6.7 ± 2.7045 in poultry. The activity of cesium-137 did not exceed the MAC. According to this study, the "acceptance of raw materials" is the most important CCP, and their control, particularly in smallscale meat processing enterprises, can actually prevent many negative outcomes. The implementation of both standards improved food quality by declining the flaw rates for patties, and the number of flow inconsistencies needed for correction in the process also dropped significantly ($p < 0.05$), demonstrating that safety and quality points were improving.

Key words: *vegetable additive, technology, processing, HACCP, food safety.*

Introduction

The rapid changes in the conditions of existence of modern society and advances in science and technology over the past few decades have raised our standard of living and have accelerated the pace of human life. On this basis, a vast and thriving market for foods with a "functional" or health benefits has emerged. More and more residents of megalopolises are inclined to buy ready-made culinary products in the supermarket or dine "outside the home" and are ready to increase their expenses for the saved time. The main criteria, which determine the choice of a ready-made dish by the consumer are high quality, homemade taste, convenience, and functionality.

The growing demand for semi-finished meat products and ready-made meals stimulates manufacturers to increase production volumes and expand the range of the products. The use of traditional raw materials in different combinations, the mixture of minced meat with raw materials of animal and vegetable origin, the introduction of food additives, the use of modern equipment and advanced technologies allows not only diversifying the list of manufactured products, giving the product different flavoring shades, but also improving the technological properties of minced meat, increasing its biological value.

The use of plant components in the technology of combined meat products provides high nutritional and biological value, contributes to increasing the flexibility of formulations, stable and uniform distribution of ingredients, minimizing losses in the production process, which ultimately leads to the creation of a product of stable quality. The introduction of vegetable raw materials into minced meat can be considered as one of the ways to obtain high-quality meat products with regulated properties. There are many different types of vegetable raw materials with which you can create a combined product [1].

Horsemeat and its products can be categorized as a health-promoting food with high protein, iron, omega-3 fatty acids, along with low-fat content. Thanks to this, horsemeat is rightfully considered dietary meat. Experts say that the absorption of horsemeat in the body is about eight times faster than the absorption of beef [2, 3]. According to nutritionists, the benefit of horsemeat is that the fats it contains are somewhere in between animal and vegetable fats. When eating horsemeat, a choleretic effect is displayed. Due to its ability to lower blood cholesterol, horsemeat is an excellent product for regulating metabolic processes in the body, and its low-fat content makes it quite suitable for diets aimed at weight loss. Horsemeat is hypoallergenic, and in addition, it is rich in vitamins group E and B, and due to this feature, the intake of horsemeat would improve blood circulation.

Most of meat foods are rich in fat and protein but deficient in complex carbohydrates like dietary fiber and its incorporation in the meat products from health point of view have been further emphasized a lot. Various types of fibers have been studied alone or in combination for the formulation of low fat meat products and meat emulsions [4-6].

Scientists are challenged with the mission of finding resources of irreplaceable food components through the use of various types of raw materials, their combination, which allows them to produce high-quality products with increased nutritional and biological value. Meat processing "adds value" to food. Value-added meat products exhibit specific tastes, color, flavor, or texture, diverse from fresh meat. Processed meat with different additives proposes diversity to the meat food sector, delivering the combined effect of nutritious food with exceptional taste. Providing

to people high-quality and environmentally safe food products can be guaranteed by developing the production of the food through creating a sustainable food future [7-9].

Food safety is the main requirement of consumers today, who pay more attention to the contents of the ingredients in nutritional labels of products, as well as the quality of the product. The increased customer concern and expectations regarding quality, safety, and diversity have enforced food producers to improve food quality and safety standards and apply management systems aimed at maintaining product standards. Then, the introduction of a food safety system will not only guarantee consumers food safety, gain their loyalty and trust, but also expand the geography of exports, strengthen its existence in the internal market, intensification of sales, and increase the competitiveness of the enterprise as a whole. Current food safety managing systems (FSMS) based on HACCP allow enterprises to have a competitive advantage in the agricultural and food sectors, opening up different worldwide markets for high value-added products and increasing the productivity of local markets. They develop the status of companies and increase consumer trustworthiness, which, in turn, helps to increase sales.

The purpose of this study was to establish and examine the implementation of HACCP by conducting a hazard analysis in a small scale meat processing enterprise for the production of patties from mixed horsemeat with vegetable components developed in the Department of Technology of Food Production and Biotechnology, Shakarim University of Semey. Furthermore, to identify CCPs, setting up preventive measure system that will lead to a safer production of meat and its products.

Materials and methods

This research was carried out at the small-scale meat products enterprise (SMPE – "Dariya") in Semey city, East Kazakhstan. The enterprise produces meat food products like sausages, patties, and cutlets. In order to meet the requirements of its consumers and partners, the enterprise had been planning to get the HACCP food safety certification. So, the key aim of the study was to establish and implement a food safety management (HACCP) for the production of patties from mixed horsemeat with vegetable components developed in the Department of Technology of Food Production and Biotechnology, Shakarim University of Semey in the enterprise. The products are focused for internal market, with its mid-term objective being entry into the Russian market after obtaining certification.

Results and their discussion

In this research work, the HACCP plan was completed according to Chapter 8 of ISO 2200:2018 and the seven basic principles of HACCP are employed by the Codex Alimentarius Commission, and implemented in production lines. The algorithm of work in the development of a food safety system based on the standards of HACCP and ISO 22000:2018 for small and medium-sized enterprises is shown (Figure 1**)**. First, the PRP-linked procedures and risk evaluation methods to identify significant hazards were presented, followed by applying a decision tree to differentiate between CCPs and operational prerequisite programs (OPRPs).

For the implementation and development of the HACCP system at the enterprise, it is compulsory to form a working group of employees with various specializations who have the proper knowledge about specific products, work experience, and methodology for developing an effective plan for the application of the HACCP system at the enterprise. The HACCP working group was multidisciplinary and composed of seven people: a HACCP team head, production technological engineer, university attendant in charge of student practice, sanitation unit engineer, quality assurance units manager, hygiene manager, and HACCP team secretary; all work was handled according to the requirements of the Standard [10]. A working group assembled to evaluate and manage all processes involved in implementing the system; and apply FSMS by engaging the help of food safety consultants. A high qualified team with responsibility can make it possible to increase the quality stages of all procedures and products.

According to HACCP-based food safety requirements, a complete description of the product should include significant safety info like composition, physical/chemical structure, microbicidal conduct, packaging, shelf-life, storing condition, method of delivery, and intended to use. The product description for patties "Shygys" can be seen in (Table 1). The target of buyers for patties "Shygys" is proposed for all groups and needed to fry before consumption.

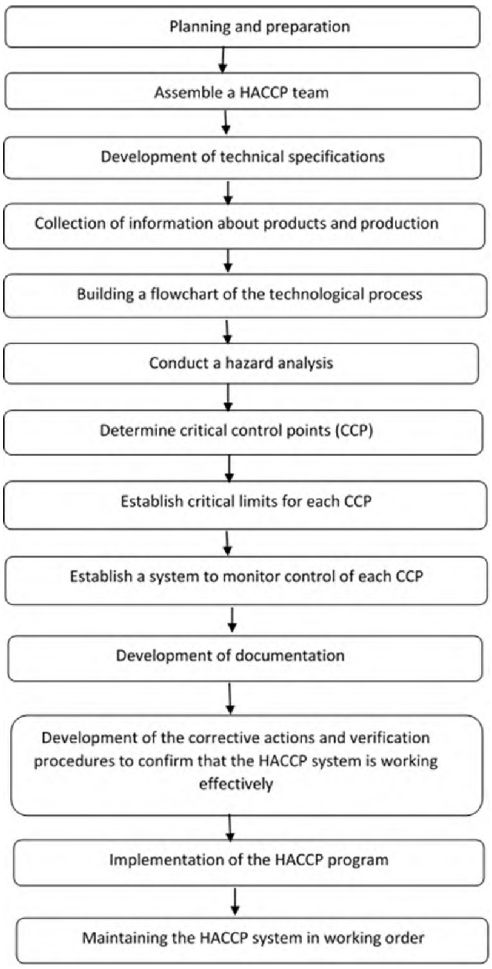

Figure 1 – Algorithm for implementing the principles of HACCP.

Table 1 – Product description of patties "Shygys"

1.	Product name	Patties "Shygys"
2.	Product description	A small (100 g) oval formed product produced from minced horse meat, horse fat, chicken meat (thighs), sprouted green buckwheat grain flour, spice, cabbage, onion, eggs.
3.	How it is to be used?	Fry in oil for 2-5 min each side.
4.	Packaging	Polyethylene bag, vacuum-packed
5.	Shelf-life	Up to 3 months at -18-20 ^{0}C
6.	Where it will be sold?	The product is sold at the retail store.
7.	Storage instructions	Keep at -18 ^{0}C
8.	Distribution conditions	In freezers at – 18 -20 ^{0}C
9.	Consumers	Adults, children, elderly adults

The flow diagram is employed as a basis for conducting risk analysis. The purpose of the diagram is to build a clear and simple series of operations, containing all phases of the process (all technological stages from the receipt of ingredients to the delivery of the product and its sale to the consumer) and detailed data on the product processing cycle, including processing modes at all stages, storage conditions, details to identify biological, chemical, and physical hazards. All these characteristics must be considered due to their significance for consumer health. The process flow diagram for the production line of the patties "Shygys" by "DARIA" SMPE is shown in (Figure 2) and was inspected internally by the food safety team. In the flowchart, all the steps of preparation can be labeled as CCPs, therefore as an initial step in developing a HACCP implementation strategy, it is necessary to implement prerequisite programs (PRPs) which include good manufacturing practices (GMP) and fundamental hygiene conditions as cleaning procedures in the processing plant. Here, after testing finished product for microbial and chemical toxins and the quality of the final product did not followed by the standard and cannot be reproccessed, the entire

batch must be disposed after a specialist has reported and has recorded the information, and the corrective measures must be applied and form filled out. Hence, each step of process demonstrated in flowchart should be identified by types of hazards, so the emplyees could make quick identification and be attentive for the possible hazards occurences.

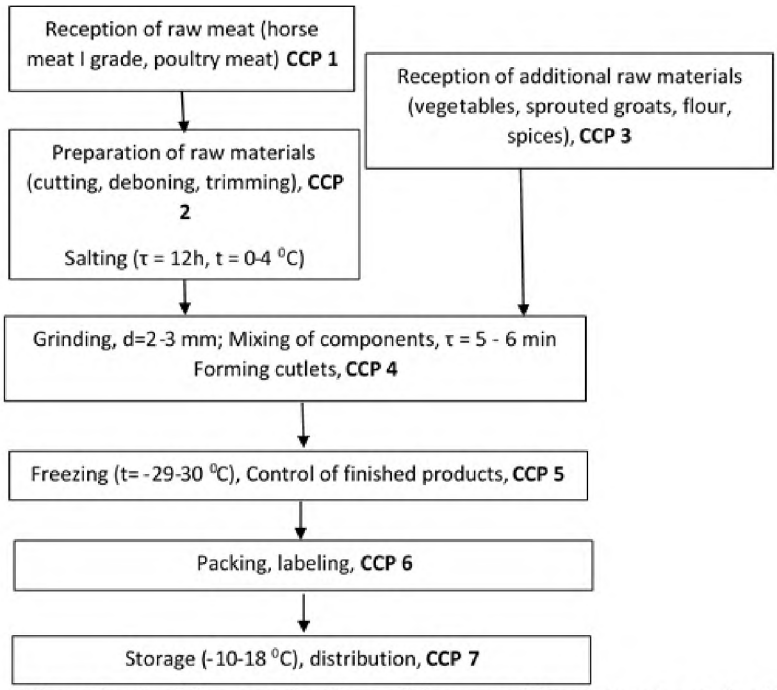

Figure 2 – Flowchart of the production of the combined meat product "Shygys"

The HACCP group must identify significant hazardous factors from the entire list of potentially dangerous elements and make a HACCP plan accordingly. It is crucial to establish the degree of control for threatening parts of different importance. Thus, the control system should focus on significant hazards that are practically expected to occur and may lead to unacceptable risks to consumer health. Without this focusing, there may be a tendency to control too many points, and the significant hazards may not be sufficiently preferred. At the same time, this does not preclude the need for action with relatively fewer hazards. A product unsafe for consumption with a threat of any biological (B), chemical (C) and physical (P), mechanical, and nutritional property is defined as a hazard. Hazard analysis was prepared by the HACCP team based on the HACCP checklist along with all the possible hazards associated with untreated material, components, procedures, the post-process operation was recognized and marked as B, C, and P. The hazards associated with various raw materials and production lines for patties manufacture and the determination of the control measures of each identified threat are shown in (Table 2). Having well answered the questions on the decision tree (Fig. 2), the detailed procedure for minimizing hazards was adopted to ensure the implementation of the HACCP (Table 3). ISO 22000 stresses risk assessment, in which assessment of hazards are identified by scoring the risk associated with severity (S) and possibility (P) of a hazard [11] from sustainability. Each hazard is evaluated and gets a score between 1 and 3. The significance of hazard resulted from hazard rating (HR) score from the multiplication of the severity by the probability is above 3. Following the hazard identification, an HR is established.

It is recognized worldwide that the application of the HACCP system in food production has clear benefits in improving food safety and preventing foodborne infectious diseases. HACCP work focuses on specific actions to ensure food safety, which is achieved by founding and applying systems and evolving food safety objectives. During a hazard analysis control, the team partook in HACCP research and verified that all the hazard strategies identification activities were implemented according to PRP, OPRP, and HACCP plans. The HACCP plan model for this study is shown in Table 3.

Table 2 – Hazards analysis and CCP determination chart of the patties production

Materials/ Process step	Category of Hazard		Is this hazard potentially significant?	Hazard assessment			Preventive measures/Control measures	CCP/ORPR/CP/NO
				S	P	HR		
1	*2*		*3*	*4*	*5*	*6*	*7*	*8*
Reception of raw materials (meat, vegetables, eggs, spices, sprouted grain, flour)	B	Salmonella, E coli, S.aureus, Listeria monocytogenes, pathogens	**Yes** – possibility of a high microbial contamination in the final product due to a high initial presence in raw materials, which can lead to the cause of diseases	3	1	3	Application of strict standards; Requirement for providers to submit licenses for verification by sanitation management staffs; adequate receiving; temperature control, lab analysis sheet of rapid screening	CCP1
	P	foreign bodies due to improper wrapping	**No** – the presence of foreign bodies cannot cause injury to the consumer	2	1	2	Visual inspection, acceptance, and removal completed by staffs; implementation of screening in consequent steps	CP
	C	antibiotics, grease, pesticide residue, allergens, toxins	**Yes** – possible presence of chemical residue due to improper storage of raw materials, or failure to remove in following steps	3	1	3	Application of strict standards; Requirement for providers to submit licenses for verification by sanitation management staffs; adequate receiving; temperature control, lab analysis sheet of rapid screening	CCP2
Storage of raw materials	B	Salmonella, E coli, S.aureus, Listeria monocytogenes, pathogens	**Yes** – microbial contamination or growth due to improper storage	3	1	3	Correct setting of storage temperature, proper equipment setting; sanitation of all the transfer equipment; management according to Warehouse Control Standards and Operating Procedures	CP
	P	-	**No** significant hazards are presented	1	1	1		NO
	C	-	**No** significant hazards are presented	1	1	1		NO
Preparation of raw materials (grinding, chopping)	B	-	**No** significant hazards are presented	2	1	2	Proper personal hygiene and handling, clean, sanitize equipment. Management according to Production Processes Control Standards and Operating Processes	CP
	C	-	**No** significant hazards are presented	1	1	1		NO
	P	-	**No** significant hazards are presented	1	1	1		NO
Mixing, forming, freezing	B	Salmonella, E coli, S.aureus, Listeria monocytogenes, pathogens	**Yes-** possibility of microbial contamination due to improper processing; incorrect mixing	2	1	2		CCP3

1	2	3	4	5	6	7	8	
	P	foreign bodies mixed in during operation processes; tools and parts of mechanical equipment mixed in due to breakage	**No**, no significant hazards are presented	2	1	2	Confirmation of mechanical equipment's reliability before and after operation. Implementation of standard operating procedures for systematic maintenance and processes to avoid foreign bodies from being mixed in.	OPRP
	C	Cleaning agents	**No,** no significant hazards are presented	1	1	1	Application of strict standards; Requirement for providers to submit licenses for verification by sanitation management staffs; adequate receiving; temperature control, lab analysis sheet of rapid screening	NO
Metal detection	B		**No,** no significant hazards are presented	1	1	1		NO
	P	foreign bodies mixed in during operation processes; tools and parts of mechanical equipment mixed in due to breakage	**Yes** - Unintended consumption of metal foreign bodies that can cause injury to the human body	3	1	3	Metal detector testing for all products. Maintenance of metal detector to be checked quarterly.	CCP4
	C		**No,** no significant hazards are presented	1	1	1		NO
Packing, labeling	B	Microbial growth due to inaccurate labeling, packaging, poor cleanliness and sanitation	**No**	2	1	2	Systematical inspection during labeling and packaging. Supervision according to Sanitation Management Standards and Operating Procedures, and Educational Training Standards and Operating Procedures.	CP
	P	risk for wrong description, foreign materials mixed in due to improper packaging	**No**	2	1	1	Extra control of information on label at each shift of product. Proper personal hygiene.	CP
	C	-	**No**	1	1	1		NO
Storage of finished product and distribution	B	-	**No,** no significant hazards are presented	1	1	1		NO
	P	-	**No,** no significant hazards are presented	1	1	1		NO
	C	-	**No,** no significant hazards are presented	1	1	1		NO

Table 3 – HACCP plan for production of patties "Shygys"

CCP	Hazard	Critical limits	Monitoring	Corrective actions	Verification	Recording
Receiving of raw materials (CCP1 and CCP3)	Biological, chemical, and physical	Supplier assurances qualities of ingredients	Visual inspection and sensory characteristics of each ingredient	Reject any dubious ingredients	Examining of supplier guarantee and visual checkup of characteristics for each raw material	Incoming materials control files
Preparation of raw materials (cutting, deboning, trimming) (CCP2)	Biological, physical	Absence of any microorganisms, free from any foreign bodies	Visual inspection, microbiological analysis	Good deboning, trimming, and washing	Microbial and visual test results	Processing quality control files
Grinding, mixing, forming (CCP4)	Biological, physical, chemical	Absence of foreign bodies and absence of microorganisms	Visual inspection, microbial legal limits, personnel hygiene	Reject or execute control receiving steps, control temperature of processing area	Microbial and visual test results, calibrating product testing and temperature	Quality record files
Forced-air-freezing (-29 to -30 ^{0}C), check final product (CCP5)	Biological	Absence of microorganisms, Temperature control	Thermometer use and microbial test	Reject if Time and temperature was not controlled	Calibrating the thermometer of the tunnel, microbial test	Records of temperature, time, and random microbial tests
Packing, labeling (CCP6)	Biological, chemical, physical	Supplier guarantee of certified package material, control weight and label.	Every batch label (date, batch code, product content)	Reject if label information is not correct	Packaging material control form	
Storage (-18 to -20 ^{0}C) and distribution	Biological	Control temperature, free from microbial contamination	Temperature measurement, microbial examination	Temperature adjustment, re-cleaning storage room, reject if contamination is evident	Control files	Records of control temperature and microbial tests

The physical contamination (foreign-body) remains to be a threat to food industry; even though there are many food safety management controls in place. To prevent intrusion of physical hazards to food there are some equipments to be used such as sifting, filters, optical sorters, magnets, metal detectors, and X-ray machines. These equipments are highly useful in food industry, ever since they can detect hazards such as stones, bone fragments, metal, as wel as hard plastic. The quick screening methods are mostly used to monitor processing of food due to easiness and simplicity of operation, avoid the need of expensive equipment, lower investment charge, lessen utility expences, and allow for suitable implementation that increases work productivity.

In addition to quick screening methods the enterprise strictly followed the Technical Regulations of the Customs Union "On Food Safety" and regularly checked any changes in testing methods stated by government.

Conclusion

In this study, a newly developed product was applied in a smallscale enterprise to meet the requirements of HACCP standard. The receiving of raw materials, heavy metals, and radionuclide detection components of the production process for "Shygys" patties were considered as CCPs, and analysis of various ingredients showed that the application of HACCP principles can improve the quality of the finished product. The study only surveyed the implementation and processing settings of ISO 22000:2018. This model can be used as a risk calculation plan for foreseeing chemical, physical, and biological hazards of raw materials and as a basis for further examinations of food safety management systems. Through the results obtained in this study, the researcher could perceive a significant improvement after the implementation of HACCP plan regarding the processing of patties in a small-scale enterprise. It could be valuable in different food productions, specifically for businesses with no testing facilities. During 1 year, the enterprise noticed the defect values of “Shygys” patties had decreased, even though it was not statistically significant, which showed that the strict implementation of standards allows the company to ensure the safety of incoming materials and, in the end, to get a safe and finest product. The continuous control of the rotation plan needs systematic outsourced testing and therefore increases testing costs. The only

following part of this plan helped the enterprise minimize the occurrence of contamination of incoming materials and, therefore, increase the quality of the final product and, with that, meet customer's demand. In addition, the enterprise's determination to improve the safety of its product "Shygys" patties had practical implications and helped to increase its discernibility and sales and create a food safety management system that meets HACCP criteria. The implementation of the international standards will benefit any enterprise with access to new markets, both internal and external; increasing productivity and competitive advantage; better quality products according to customer preferences; improving reporting and communications; and moreover, bringing a new product into the market means delivering new value to the customer.

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НАССР ПРИНЦИПТЕРІН ҚОЛДАНА ОТЫРЫП, ЖЫЛҚЫ ЖӘНЕ ТАУЫҚ ЕТІНЕН ӨНГЕН ЖАСЫЛ ҚАРАҚҰМЫҚ ЖАРМАСЫ ҚОСЫЛҒАН АРАЛАС ӨНІМДІ ӘЗІРЛЕУ

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Бұл зерттеу «Семей қаласының Шәкәрім атындағы университеті» КеАҚ, «Тамақ өндірісінің технологиясы және биотехнология» кафедрасында әзірленген жылқы еті мен өсімдік компоненттермен қоспасынан жасалған жаңа өнімге (котлет) арналған НАССР нақты жоспарын әзірлеу мақсатында "ДАРИЯ" ет өңдеу кәсіпорнында жүргізілген. Сыни бақылау нүктелері (СБН) НАССР жоспарында анықталған және қолданылған. Өңдеудің әр кезеңінде әр түрлі қауіптер анықталды, ал НАССР жоспарындағы әрбір СБН анықталып, тиісті маңызды қауіп, сыни шек, СБН мониторингі және түзету әрекеттерімен бірге жүрді, бұл кәсіпорын НАССР әдістемесін толығымен қолданғанын растады. Бактериялардың, ауыр металдардың, пестицидтердің қалдықтарының және физикалық ластану деңгейінің жылдам скринингі сонымен қатар ресурстарға қатысты болжамды мәселелерді шешуге және өнім сапасына кепілдік беру арқылы бақылау тиімділігін арттырды. Жылқы етіндегі цезий-137 мөлшері 5,4 ± 2,9627 Бк/кг, ал құс етінде 6,7 ± 2,7045 Бк/кг құрады. Цезий-137 белсенділігі шекті рұқсат етілген концентрациядан аспады. Осы зерттеуге сәйкес, «шикізатты қабылдау» ең маңызды СБН болып табылады және оларды бақылау, әсіресе шағын ет өңдеу зауыттарында, көптеген жағымсыз әсерлердің алдын алады. Стандартты енгізу дайын өнімдегі (котлетте) ақаулардың санын азайту арқылы тағамның сапасын жақсартты, ал түзетуге қажетті технологиялық сәйкессіздіктер саны да айтарлықтай төмендеді ($p < 0,05$), бұл қауіпсіздік пен сапа көрсеткіштерінің жақсарғанын көрсетеді.

Түйін сөздер: *өсімдік қоспасы, технология, өңдеу, НАССР, азық-түлік қауіпсіздігі.*

РАЗРАБОТКА КОМБИНИРОВАННОГО ПРОДУКТА ИЗ КОНИНЫ И КУРИЦЫ С ПРОРОЩЕННОЙ ЗЕЛЕНОЙ ГРЕЧНЕВОЙ КРУПОЙ С ИСПОЛЬЗОВАНИЕМ ПРИНЦИПОВ НАССР

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Это исследование разработано для мясоперерабатывающего предприятия "ДАРИЯ" с целью разработки конкретного плана НАССР для нового продукта (котлет), приготовленного из смеси конины с растительными компонентами, разработанного на кафедре «Технология пищевых производств и биотехнологии» НАО «Университет имени Шакарима города Семей». Критические контрольные точки (ККТ) были определены и применены в плане НАССР. Различные опасности были обнаружены на каждом этапе обработки, в то время как каждый ККТ в плане НАССР был идентифицирован и сопровождался соответствующей значительной опасностью, критическим пределом, мониторингом ККТ и корректирующими действиями, подтверждая, что предприятие полностью использовало методологию НАССР. Быстрый скрининг количества бактерий, тяжелых металлов, остатков пестицидов и уровней физического загрязнения также повысил эффективность мониторинга, позволив им решать предсказуемые проблемы, связанные с ресурсами, и гарантировать качество продукции. Содержание цезия-137 в конине составило 5,4 ± 2,9627 Бк/кг, а в мясе птицы – 6,7 ± 2,7045 Бк/кг. Активность цезия-137 не превышала ПДК. Согласно этому исследованию, "приемка сырья" является наиболее важным ККТ, и их контроль, особенно на небольших предприятиях по переработке мяса, может фактически предотвратить многие негативные последствия. Внедрение стандарта улучшило качество пищевых продуктов за счет снижения количества дефектов в готовом продукте (котлетах), а количество несоответствий в технологическом процессе, необходимых для исправления, также значительно снизилось ($p<0,05$), демонстрируя, что показатели безопасности и качества улучшаются.

Ключевые слова: *растительная добавка, технология, переработка, НАССР, безопасность пищевых продуктов.*

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ЖАСАНДЫ АСҚАЗАН-ІШЕК ЖОЛДАРЫ ОРТАСЫН МОДЕЛЬДІК ЖҮЙЕСІНДЕ КАПСУЛАЛАНҒАН БИОЛОГИЯЛЫҚ БЕЛСЕНДІ ҚОСПАНЫҢ БОСАТЫЛУЫН ЗЕРТТЕУ

Андатпа: *Қазіргі уақытта қалпына келтіретін және иммуностимуляциялық әсерге деген қажеттілік едәуір артты. Оларды өндіру үшін табиғи компоненттер қолданылады, олар ұзақ уақыт қолданылса да, адам ағзасында жағымсыз салдарлар тудырмайды. Экологиялық жағдайдың нашарлауы, созылмалы стресс, отырықшы өмір салты, теңгерімсіз тамақтану – бұл үнемі әсер ету кезінде дененің жалпы қарсыласуының төмендеуіне әкелетін факторлар. Нәтижесінде дененің жекелеген мүшелері мен жүйелерінің (тыныс алу, асқазан-ішек жолдары) аурушаңдығы жоғарылайды, гормоналды реттеу бұзылады, дененің иммунологиялық күштері төмендейді. Осыған байланысты иммундық тапшылықтың алдын-алу және емдеу үшін қолданылатын дәрілік өсімдіктерден алынған биологиялық қоспалар әсіресе танымал. Шөптік препараттар синтетикалық аналогтардан жұмсақ терапиялық әсерімен, сондай-ақ айқын жанама әсерлерінің болмауымен жақсы ерекшеленеді.*

Эксперимент жүргізу үшін капсулаланған биологиялық белсенді қоспа (ББҚ) 2 сағат ішінде pH 2,0 асқазан сөлінің модельдік ортасына орналастырылды, содан кейін капсулалар 3 сағат ішінде pH 7,2 аш ішектің модельдік ортасына көшірілді. Бұл схема асқазан-ішек жолдарының моделіне еліктейді.

Түйін сөздер: *капсула, биологиялық белсенді қоспа, асқазан, альгинат, эхинацея, левзея.*