Various sensor types that measure and monitor material properties, process parameters sensors, mechanism/device adjustment monitoring sensors, machine-steering and speed control sensors, cab ergonomic sensors, system functionality diagnostic sensors, and sensors for multispectral remote sensing data, are combined in a single CH to enhance and maintain consistent harvesting performance.

Even if the mechanical design and manufacturing method have altered somewhat in recent years, CH design has incorporated several innovations in sensor and control technology, improving functionality, overall efficiency, work quality, and operating conditions [2].

CHs are highly variable depending on their operation and level of automation. Some are operator-dependent, while others are totally automated with high performance, adaptability to changeable scenarios, little grain loss, and maximum grain quality processing. Internal systems may need highly trained personnel and operators, as well as complex service and maintenance procedures.

Conclusion: Logistic regression model is used as a best fit (as expected) to the CH data. When employing combine harvesters for pre-defined purposes and situations, many factors should be taken into account, one of which is a clear knowledge of the totality of variability and level of complexity required for a specific task: yield, situation, environment, social sphere, etc. The degree of complexity is determined by the level of automation in this study, which, in turn, depends on the use of sensors.

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BENEFITS OF PROBIOTICS APPLICATION IN DAIRY CATTLE PRODUCTION

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Abstract. *The paper briefly discusses the role of probiotics in dairy cattle productivity. There is a rising interest in using probiotics to improve the productivity and health of livestock. Probiotics can improve animal immunity, growth, and productivity, and do not damage the beneficial intestinal microflora. They help to improve the quality of milk and colostrum, and hence increase the young animals' resistance and safety.*

Keywords*: probiotics, milk, dairy cattle, immunoglobulins*

Introduction: Dairy production is considered one of the leading branches of the agro-industrial sector. Because of this, any unfavorable reduction in milk production caused by illness or malnutrition in lactating animals could lead to significant economic losses. Furthermore, a high disease risk in the livestock chain could result in public health issues, including the emergence of antibiotic resistance [1]. Antibiotics have been banned in many nations as growth promoters due to zoonotic risks. Therefore, searching for novel, non-toxic, and biosafe substances is urgently needed. Probiotic, prebiotic, and synbiotic use is regarded as a suitable alternative to treat diseases. In the livestock industry, the use of natural, affordable probiotic-based supplements to support animal growth and health has recently grown [2, 1]. Applying probiotics to dairy animals and other livestock to maintain their overall health, immunity, and nutritional needs could offer a long-term solution to these issues. “Probiotics are live beneficial bacteria that, when administered in adequate amounts, confer a health benefit on the animal by colonizing the gastrointestinal tract and assisting the native microflora already present in the animal's digestive system”.

Research purpose: to assess the role of probiotics in dairy cattle productivity.

Materials and methods: Relevant scientific materials are collected and reviewed. The most important ones that addressed the area of interest and objective

are considered and briefly discussed concerning the probiotic use in dairy cattle productivity.

Results and discussion: Probiotics can improve dairy animal productivity by reducing disease load, modulating rumen metabolism, modulating host gene expression and increasing milk production. There is rising interest in using probiotics to help newborn calves gain weight and become more resistant to disease [3]. Probiotics are therefore mainly used to create equilibrium conditions in the rumen and gut microflora by boosting the population of beneficial microbial species [4].

Xu et al. [4], reported that probiotics particularly increase the relative abundance of helpful organisms that aid in preventing pathogen invasion of the gastrointestinal system. They are used to enhance digestive health, relieve bloating, prevent diarrhea, and safeguard against infectious diseases. As reported by researchers, probiotics given orally to ruminants have been shown to have a variety of positive effects, like regulating and balancing the microorganisms in the gut, aiding in animal development, and increasing the host's resistance to disease. According to studies, adding probiotics to ruminants' feed may improve growth, production, and health while also improving the animals' general well-being. Using probiotics has been demonstrated to reduce the negative environmental effects of ruminant production, such as methane emission.

The quality improvement in milk production brought on by probiotics has also been noted by researchers. In an experiment conducted by Suntara et al. [5] on lactating Holstein cows, an interesting fact was reported: administration of animal feed prepared with Crabtree-negative yeast (P. kudriavzevii KKU20 and C. tropicalis KKU20) increased the milk protein content. This is linked to an increasing number of helpful microbes in the rumen, which also boosts the amount of microbial protein.

As a result of the research conducted by Trebukhov et al. [6], a decrease in the level of immunoglobulins with each subsequent day of lactation was revealed. It was found that probiotic use increased the level of immunoglobulins in colostrum by 31.4% on the first day of lactation and by 14.1% on the second day (Table 1). Therefore, colostrum from cows that has been given a probiotic treatment has a higher level of immunoglobulins, which increases the young animals' resistance and safety.

Table 1

Immunoglobulin level in cow colostrum [6]

Parameter	Sampling days	Groups	
		Control (SD)	Experimental (SD + probiotic)
Immunoglobulin, g/l	1	91.9	123.5
	2	49.6	57.8
	3	12.1	13.8

SD* - a standard diet

In a study by Xu et al. [4] on dairy cows of the Holstein breed using the probiotic mix Lactobacillus casei Zhang and Lactobacillus plantarum P-8, supplementation of probiotics significantly increased the contents of milk immunoglobulin G (IgG), lactoferrin (LTF), lysozyme (LYS), and lactoperoxidase (LP) (Fig. 1). When compared to day 0 before the probiotic treatment, the milk IgG (Fig. 1A) and LP (Fig. 1D) content at days 15 and 30 considerably increased. With the use of probiotics, the levels of LTF (at day 15) (Fig. 1B) and LYS (at both day 15 and day 30) (Fig. 1C) were significantly increased.

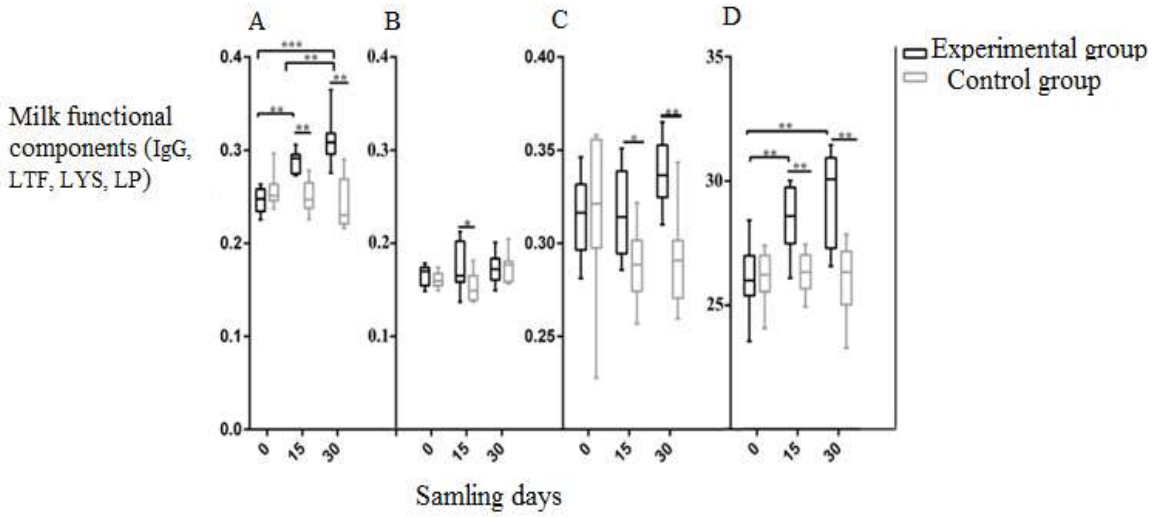

Fig. 1. Effect of probiotics on concentrations of milk functional components (IgG, LTF (mg/ml), LYS, LP (мл/. мл)) [4]

(*P < 0.05, **P < 0.01, ***P < 0.001)

A number of researchers have reported that taking probiotics helps increase both the quantity and quality of milk [7, 4, 3]. Additionally, Kumar [7] noted that adding 20 grams of multi-strain probiotics to the diet of lactating cows boosted milk production by 29.13%, followed by 15 grams (17.70%) and 10 grams (8.31%), respectively. The mean fat percentage also increased to 2.06, 5.36, and 10.65 percent for the respective treatments, whereas the mean SNF percentage increased to 0.75, 2.24, and 7.89 percent, respectively (Table 2). It signified that the productivity of the animals had improved, resulting in more earnings for the farmer. Therefore, the use of probiotics in dairy animals' diets should be encouraged.

Table 2

Effect of probiotics on milk yield & milk composition ($\bar{x}$±SE) [7]

Parameters	Trial (Weeks)	Control (FFS)	(FFS + probiotics @ 10 gm/day	(FFS + probiotics @ 15 gm/ day	(FFS + probiotics @ 20 gm / day
AMY (4%	Pre-trial period Trial period	5.66±0.14 5.73±0.06NS	6.02±0.10 6.52±0.07*	5.99±0.23 7.05±0.19*	6.11±0.14 7.89±0.21*

FCM)	Post-trial period	5.80±0.12 NS	6.63±0.09*	7.26±0.27*	8.47±0.21*
Fat %	Pre-trial period	4.22±0.07	4.36±0.06	4.29±0.16	4.32±0.09
	Trial period	4.24±0.03 NS	4.45±0.02*	4.52±0.09*	4.78±0.08*
	Post-trial period	4.27±0.07 NS	4.49±0.04*	4.60±0.15*	4.93±0.12*
SNF %	Pre-trial period	7.99±0.24	8.01±0.11	8.05±0.12	8.11±0.12
	Trial period	8.01±0.14 NS	8.07±0.04*	8.23±0.08*	8.75±0.08*
	Post-trial period	8.02±0.23 NS	8.12±0.07*	8.29±0.12*	8.79±0.10*

(*Significance (P≤0.05); NS=non significance(P≥0.05); FFS= farm feeding schedule; AMY=average milk yield; FCM= fat corrected milk)

According to Xu et al. [4], probiotic administration could decrease somatic cell count (SCC), reduce udder inflammation, and boost milk yield. The study by Trebukhov [6], proved that the average concentration of colostrum immunoglobulins was higher in the fourth lactation than it was in the first, second, and third lactations. Moreover, the probiotic preparation "Vetom 1.2" was effective in improving the immuno-biochemical state of animals by improving the biochemical parameters' dynamics of cows' blood serum. There was a rise in serum immunoglobulins: albumin by 14.4%; alpha, beta, gamma globulin by 16.3%, 13.7%, and 17.8%, respectively.

Conclusion: Probiotics increase the relative abundance of beneficial microbial species that aid in preventing pathogen invasions of the gastrointestinal system. They are used to enhance digestive health, prevent diarrhea, and safeguard against infectious diseases by increasing the animal's resistance to disease. Probiotic administration could also decrease somatic cell count (SCC), udder inflammation, boost milk yield, improve milk quality, and the contents of milk components. Moreover, improve the level of colostrum immunoglobulins, which increases the young animals' resistance and safety. Therefore, applying probiotics in dairy animals' diet has a long-term beneficial effect, so it should be encouraged.

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DIGITALE KOMPETENZEN VON VETERINÄR-STUDIERENDEN

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Аннотация: *Трансформация экономики затрагивает различные сферы, в том числе и сельское хозяйство. Подготовка ветеринарных специалистов сегодня должна проводиться в ключе формирования цифровых компетенций. Авторы рассматриваются основные цифровые компетенции будущих ветеринаров. С статье приведены результаты констатирующего этапа эксперимента, которые свидетельствуют о низком уровне сформированности цифровых компетенций у студентов специальности ветеринария в аграрном техникуме*

Ключевые слова: *ветеринарные специалисты, профессиональное обучение, трансформация образования, цифровые компетенции, цифровая трансформация образования*

Im Kontext des Übergangs der russischen Gesellschaft zu einer digitalen Wirtschaft ist die Einführung von Technologien in den Bildungsprozess, die den Anforderungen der Weltgemeinschaft entsprechen, eine Verbesserung der Qualität