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## **Protective properties of the fleece of Taurian ewes of the Askanian fine fleece breed depending on the breeding differentiation rank**

**Vasyl Tyrunskiy\***

Doctor of Agricultural Sciences

National University of Life and Environmental Sciences of Ukraine

03041, 15 Heroiv Oborony Str., Kyiv, Ukraine

<https://orcid.org/0000-0002-0312-694X>

**Nataliia Bogdanova**

PhD in Agricultural Sciences

National University of Life and Environmental Sciences of Ukraine

03041, 15 Heroiv Oborony Str., Kyiv, Ukraine

<https://orcid.org/0000-0002-4634-9609>

**Peter Lyutskanov**

Doctor of Biological Sciences

Institute for Biotechnological Field Research in Animal Science and Veterinary Medicine

MD-6525, Maximovca, Republic of Moldova

<https://orcid.org/0000-0002-1603-0234>

**Abstract.** The study of factors affecting the humidity and contamination of the outer and inner zones of the staple, which further affects the yield of pure wool and its technological properties, is one of the current problems of fine-fleeced sheep breeding. Purpose of the study – evaluate the protective properties of wool fleece depending on the rank of breeding differentiation of sheep. The determination of ranks is based on the regularities of the normal distribution of animals in the population and herd reproduction indicators. 10 ranks were used. The paper presents the results of a laboratory study of the content of mineral impurities and the degree of contamination of the staple. Sheep were divided into 10 ranks of breeding differentiation. The regularities of the normal distribution of animals in the population are considered. The obtained data indicate that the variety of sheep in terms of the content of mineral impurities in wool is very large. The

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\*Corresponding author



coefficient of variation is 35% with a variation in the ranks of breeding differentiation from 13.7 to 38.4%. With an increase in the group of the total value of sheep for breeding purposes, the value of the coefficient of variation decreases ( $r_s = -0.871 \pm 0.245$ ). With an increase in the ranks of breeding differentiation, the average absolute indicators of contamination of the outer zone of the staple tend to increase ( $r_s = +0.257 \pm 0.483$ ), and the relative values decrease ( $r_s = -0.600 \pm 0.400$ ). The average absolute contamination rate of the inner zone of the staple is 3.02 cm with a range of ranks from 2.83 to 3.29 cm. According to the relative degree of contamination, these indicators are 32.5% and from 31.0 to 35.2%, respectively. With an increase in the breeding differentiation rank of sheep, the absolute indicators of contamination of the length of the inner zone of the staple increase ( $r_s = +0.600 \pm 0.400$ ), and relative values tend to decrease ( $r_s = -0.486 \pm 0.437$ ). The individual variety of ewes in terms of the degree of contamination of the inner zone of the staple is quite high. The coefficients of variation for absolute and relative indicators of this feature are 28.5 and 30.4%, respectively. The value of the coefficients of variation decreases slightly with an increase in the ranks of breeding purposes of animals. The rank correlation is  $-0.371 \pm 0.464$  in absolute terms and  $-0.543 \pm 0.420$  in relative terms. Breeding differentials of the leading groups of ewes are low. Using this rank technique allows controlling the system of sheep valuation, supplementing it with the value of breeding differentials at the final stages of analysis and selection; in production conditions allows forming technological groups of sheep to produce outstanding ram breeders

**Keywords:** merinos; sheep; impurity content; degree of contamination; staple; pure wool

## Introduction

Wool is the main product of fine-fleeced sheep and an important raw material for the light industry. However, its production in many countries and around the world has recently declined significantly (Avercheva, 2020; Suprun *et al.*, 2021). One of the reasons for this is that the cost of wool production is higher than the selling price. Increasing the level of profitability of sheep farming largely depends on the quality of products. A significant reserve for the production of high-quality wool is the breed improvement of sheep. This is evidenced by the positive effect of using Australian Merino and New Zealand Corriedales. As noted by N. Boyko *et al.* (2022) the assessment of the physical and technical parameters of wool is necessarily regulated by the current state standards and instructions for conducting breeding work. This

determines the effectiveness of breeding for further improvement of sheep breeds.

Current positive trends in the development of the agricultural sector of Ukraine also indicate encouraging prospects for sheep farming. The issue of creating specialised genotypes of mutton and dairy sheep is being resolved (Vdovychenko & Zharuk, 2019). Existing breeds are being improved to increase precocity and growth intensity (Makovicky *et al.*, 2019; Pomitun *et al.*, 2021), fattening and mutton qualities (Mashner & Lyutskanov, 2019). A comprehensive assessment of sheep with productivity is carried out aimed at improving the quality of wool (Korkh *et al.*, 2022; Ramos *et al.*, 2023). The protective properties of wool suint are studied in sheep of various breeds (Stapai *et al.*, 2019; Korbych & Salyvonchik, 2019; Korbych & Odnorih, 2021).

Recently, when crossing sheep of the wool direction of productivity with sheep of mutton breeds, offspring of an improved meat type are obtained, which increases the profitability of both wool and lamb production. N. Boyko *et al.* (2022) investigated the qualitative characteristics of sheep wool of the Prydniprovskya mutton breed in relation to their gender and genotype. Thus, in sheep and yearling ewes, the degree of wool fineness is mainly 58–60 points of quality, in replacement rams and breeding rams – 56–60 points. The light colour of the suint was observed in yearling ewes of the MOI genotype, which outperformed the ML, MDt, and MT genotypes by 60%, 20%, and 50%, respectively. The average score for suint quality ranged from 3 points in yearling ewes of the MDt genotype to 5 points in sheep of the MOI genotype. The share of technologically more valuable light suint in the wool of MOI yearling ewes led to an increase in the overall score for its quality by 2.0 points or 66.7 %. According to P. Stapai *et al.* (2019) the use of Suffolk rams on Prekos ewes also had a positive effect on the quantitative and qualitative parameters of suint in their offspring.

According to M.L. Heimbuch *et al.* (2023) the genetically determined makings of high sheep productivity based on traits that meet the needs of global and domestic markets for sheep products are of particular importance. The hereditary makings of organisms change under the influence of selection (Herman *et al.*, 2019; Ramos *et al.*, 2021). The use of modern breeding methods is an important scientific and industrial task. The theoretical basis for the selection of farm animals, including sheep, consists of patterns of heredity, variability, selection, breeding, and features of the development and use of the breeding structure of the population. The effectiveness of the breeding process depends on the actual effectiveness of the selection and use of breeding rams and

ewes (Pomitun *et al.*, 2020; Ramos *et al.*, 2023). Sheep make up the largest group of animals in the herd structure. They are in the production process for a long time and significantly affect the formation of a variety of hereditary productivity traits of new generations of descendants in the population. The individual productivity variety of sheep is significantly higher than that of sheep producers. But it is very difficult to effectively use this variety for breeding purposes, since the total number of ewes in the herd is too large for the rapid detection and widespread use of individual highly productive ewes. Therefore, there was an objective need for breeding division of the number of ewes into separate groups (ranks of breeding differentiation), depending on the complex level of animal productivity. In this regard, the purpose of the study was to evaluate the protective properties of the sheep wool fleece depending on the rank of breeding differentiation.

## Materials and Methods

The study was conducted on a number of Taurian ewes ( $n = 130$ ) of the Askanian fine-fleeced sheep breed, according to breeding records from the “Chervonyi Chaban” breeding plant in the Kherson oblast.

During valuation, the entire number of sheep (4 flocks) was divided according to the breeding differentiation ranks. The determination of ranks is based on the regularities of the normal distribution of animals in the population and herd reproduction indicators. 10 ranks were used. The 1st rank (elite unique) includes sheep with an excess of the average level of productivity by three standard deviations ( $+3\sigma$ ) or more; the 2nd (elite selective) – excess from  $+2$  to  $+3\sigma$ ; 3<sup>rd</sup> (elite breeding) – from  $+1$  up to  $+2\sigma$ ; 4<sup>th</sup> (repair elite) – within  $+1\sigma$ ; 5<sup>th</sup> (standard elite) – animals that have average productivity indicators; 6th (mediocre elite) – deviation within up

to  $-1\sigma$  from the average level of productivity; 7<sup>th</sup> (first-class standard) – from  $-1$  to  $-2\sigma$ ; 8<sup>th</sup> (first-class mediocre) – deviation to  $-3\sigma$ ; 9<sup>th</sup> (second-class) and 10<sup>th</sup> (rejects) – deviation from the average level of productivity exceeds  $-3\sigma$ .

For laboratory testing of wool within each flock of sheep, 5% of animals were selected by random sampling (every 20<sup>th</sup> ewe). Wool samples weighing 30–40 g were selected from each animal selected for analysis, which were subjected to laboratory tests. The content of mineral impurities and the depth of contamination of the outer and inner zones of the staple were determined in wool. The content of mineral impurities in the wool was determined by washing in a soap-soda solution, followed by drying to a constant weight of samples. Contamination of the outer and inner zones of the staple was determined by measuring the depth of penetration of mineral impurities. Measurements were made directly in the staples and between staples.

Within the groups formed by the rank of breeding differentiation and for the entire population of experimental ewes, the average development indicators of each of the considered traits ( $M \pm m$ ) and variability coefficients ( $Cv$ , %), which were calculated by the ratio of the mean square deviation to the average in the group; breeding differentials ( $Sd$ ) and the value of rank correlation ( $rs$ ) as an indicator of the dynamics of genetic and population parameters were determined. During the study, the technology of keeping sheep in the “Chervonyi Chaban” breeding plant did not change. Ewes received a diet according to generally accepted feeding standards. When working with animals, the bioethical requirements of the Law

of Ukraine No. 3447-IV “On the Protection of Animals from Cruelty” (2006) and ARRIVE guidelines for reporting experiments using live animals were observed.

## Results and Discussion

As noted by R. Atav *et al.* (2020), the complex productivity of fine-fleeced sheep includes a significant number of qualitative characteristics. In breeding practice, qualitative characteristics in most cases are evaluated during sheep valuation (main, preliminary, and additional). They are also evaluated in production conditions when classifying wool and preparing raw materials for sale. A significant number of qualitative features are evaluated by laboratory methods. Conducting studies of wool in certified laboratories allows evaluating its characteristics and determining a number of features that determine the shearing of wool and its changes in the sheep ontogenesis. These signs include: the content of fat and sweat in wool; the sweat: fat ratio; the content of impurities and moisture in the fleece; absolute and relative contamination of the outer and inner zones of the staple. These signs characterise the protective properties of wool fleece as one of the important components of its quality properties.

In the course of the study, the protective properties of the wool fleece (for each rank) are established based on the content of mineral impurities in the wool and the degree of contamination of the length of the inner and outer zones of the staple. On average, the constant weight of unwashed wool contains 17.1%. Percentage of mineral impurities with fluctuations in sheep groups from 16.1 to 19.9% (Table 1).

**Table 1.** Content of mineral impurities in a constant weight of unwashed wool, %

Rank number	n	M±m	Cv, %	Lim	
				min	max
1-2	3	19.6±1.56	13.7	16.7	22.0

Table 1. Continued

Rank number	n	M±m	Cv, %	Lim	
				min	max
3	12	19.9±1.72	30.0	11.1	26.4
4	26	17.7±1.13	32.7	9.0	30.6
5-6	52	16.1±0.85	38.4	7.4	31.6
7-8	28	17.2±1.12	34.3	5.8	29.5
9-10	9	17.0±2.17	38.4	10.6	31.7
In the entire sample	130	17.1±0.53	35.0	5.8	31.7

With an increase in the rank of breeding differentiation of sheep, the slightly increasing content of impurities in wool increased slightly ( $r_s = +0.771 \pm 0.358$ ). This situation can occur when combining clippings of pure wool and sufficient size from animals with a relatively low density and suint content in fleece. In this regard, it is possible to modify the patterns due to economic and environmental conditions in the industrial use of sheep. The limits of individual indicators of the content of mineral impurities in wool ranged from 5.8 to 31.7%. The difference was 25.9%. According to the gradations of breeding differentiation, this difference ranged from 5.3 to 24.6%. For breeding groups of sheep, the minimum mineral impurity content increased ( $r_s = +0.657 \pm 0.377$ ), the maximum – decreased ( $r_s = -0.829 \pm 0.280$ ), and the difference between them also decreased ( $r_s = -0.800 \pm 0.300$ ).

The variety of ewes in terms of the content of mineral impurities in wool is very large. The variation coefficient is 35% with a divergence

in the ranks of breeding differentiation from 13.7 to 38.4%. With an increase in the group of total value of sheep for breeding purposes, the value of the variation coefficient decreased ( $r_s = -0.871 \pm 0.245$ ). But this is not an obstacle to improving the protective properties of fleece, since there was a significant variety of sheep in terms of the content of mineral impurities in the coat. Average differential of the first three groups of sheep by this feature varied from 0.6 to 2.8% (relative – from 3.5 to 14.6%). For the first three groups of sheep, the absolute breeding differential was 1.9%, and the relative differential was 11.2%. This situation with indicators of the content of mineral impurities in the fleece and a system of careful selection of sheep according to the complex level of productivity can be explained by relatively lower indicators of fat content in sheep wool, some loss of fleece density, and insufficiently high resistance and structure of suint content to atmospheric factors and production conditions of keeping sheep during the year.

Table 2. Depth of penetration of the outer contaminated zone of the sheep staple, cm

Rank number	n	M±m	Cv, %	Lim	
				min	max
1-2	3	5.17±0.44	14.8	4.5	6.0
3	12	4.46±0.27	21.9	2.5	6.0
4	26	5.00±0.16	16.2	4.0	6.5
5-6	52	4.72±0.11	17.5	3.0	7.0
7-8	28	4.96±0.18	19.0	3.5	7.0
9-10	9	4.78±0.26	16.6	4.0	6.5
In the entire sample	130	4.82±0.08	17.8	2.5	7.0

The average absolute depth of penetration of the contaminated outer staple zone for the entire sheep population is 4.82 cm with a variation in the ranks of breeding differentiation from 4.46 to 5.17 cm (Table 2).

According to relative characteristics, these indicators are 52.5% and from 48.2 to 58.6%, respectively (Table 3).

With an increase in the ranks of breeding differentiation, the average absolute indicators of contamination of the outer zone of the staple tended to increase ( $r_s = +0.257 \pm 0.483$ ), and the relative values decreased ( $r_s = -0.600 \pm 0.400$ ). The limits of individual values of absolute contamination indicators of the outer zone of the staple were in the range from 2.5 to 7 cm, and relative values – from 33.3 to 77.7%. For breed-

ing groups of sheep, the difference in individual extreme values of absolute indicators of contamination of the outer zone of the staple ranged from 1.5 to 4.0 cm, and relative – from 15.1 to 37.3%. In the best sheep in terms of complex value, the absolute minimum indicators of individual diversity remained almost unchanged ( $r_s = +0.129 \pm 0.496$ ), the maximum slightly decreased ( $r_s = -0.643 \pm 0.383$ ), and the difference between them tended to decrease ( $r_s = -0.286 \pm 0.479$ ). According to relative characteristics, the minimum values of individual animal variety for this trait did not change ( $r_s = -0.043 \pm 0.499$ ), the maximum significantly decreased ( $r_s = -0.814 \pm 0.290$ ), the difference between them also significantly decreased ( $r_s = -0.814 \pm 0.290$ ).

**Table 3.** Proportion of contamination of the outer zone of the sheep staple, %

Rank number	n	M±m	Cv, %	Lim	
				min	max
1-2	3	54.8±4.36	13.8	47.4	62.5
3	12	48.2±2.59	18.6	33.3	70.6
4	26	51.9±1.14	11.2	44.1	66.7
5-6	52	51.4±1.05	14.8	36.8	71.4
7-8	28	55.0±1.67	16.1	44.4	77.8
9-10	9	58.6±2.64	13.5	44.4	71.4
In the entire sample	130	52.5±0.70	15.2	33.3	77.8

On the studied livestock, a significant variety of ewes was found in terms of the degree of contamination of the outer zone of the staple in absolute and relative terms. The coefficients of variation were 17.8% and 15.2%, respectively, with fluctuations in the breeding groups of animals from 14.8 to 21.9% and from 11.2 to 18.6%, respectively. The value of the variation coefficients practically did not change due to the selection of sheep for the complex level of productivity – the rank correlation for absolute and relative characteristics was  $-0.251 \pm 0.483$  and  $+0.143 \pm 0.495$ , respectively.

Breeding differentials for absolute and relative indicators of contamination of the outer zone of the staple of sheep of the first leading ranks ranged from  $-0.36$  to  $+0.35$  cm and from  $-0.6$  to  $-4.3\%$ , respectively. Practically, the belonging of sheep to the best groups for breeding purposes was slightly determined by the specifics of contamination of the outer zone of the staple. Although in general, with an increase in the rank of breeding differentiation of sheep, the relative degree of contamination of the outer zone of the staple decreased ( $r_s = -0.600 \pm 0.400$ ).

**Table 4.** Penetration depth of the inner contaminated zone of the sheep staple, CM

Rank number	n	M±m	Cv, %	Lim	
				min	max
1-2	3	3.17±0.17	9.1	3.0	3.5
3	12	2.96±0.16	18.3	2.0	4.0
4	26	3.29±0.16	24.4	1.5	5.5
5-6	52	2.90±0.13	33.1	1.0	5.5
7-8	28	3.07±0.18	9.4	1.5	6.0
9-10	9	2.83±0.19	19.7	2.0	3.5
In the entire sample	130	3.02±0.08	28.5	1.5	6.0

The average absolute contamination rate of the inner zone of the staple is 3.02 cm with a range of ranks from 2.83 to 3.29 cm (Table 4).

According to the relative degree of contamination, these indicators are 32.5% and from 31.0 to 35.2%, respectively (Table 5).

**Table 5.** Proportion of contamination of the inner zone of the sheep staple, %

Rank number	n	M±m	Cv, %	Lim	
				min	max
1-2	3	33.9±3.29	16.8	27.3	37.5
3	12	32.3±1.48	15.9	23.8	38.9
4	26	32.3±1.66	26.2	15.8	50.0
5-6	52	31.0±1.52	35.3	10.5	57.1
7-8	28	34.6±2.14	32.8	17.7	66.7
9-10	9	35.2±2.89	24.6	22.2	46.2
In the entire sample	130	32.5±0.87	30.4	10.5	66.7

With an increase in the rank of breeding differentiation of sheep, the absolute indicators of contamination of the inner zone of the staple increased ( $r_s = +0.600 \pm 0.400$ ), and the relative values tended to decrease ( $r_s = -0.486 \pm 0.437$ ). The limits of individual absolute indicators of contamination of the internal staple were in the range from 1.5 to 6.0 cm, and relative characteristics – in the range from 10.5 to 66.7%. According to the ranks of sheep breeding differentiation, the minimum absolute and relative indicators of individual animal variety tended to increase. The rank correlation value was  $-0.486 \pm 0.437$  and  $+0.457 \pm 0.445$ . For the maximum individual indicators, there was a downward trend –

the rank correlation was  $-0.657 \pm 0.377$  and  $-0.229 \pm 0.487$ , respectively. The difference between the maximum and minimum individual indicators of contamination of the inner zone of the sheep staple also slightly decreased with an increase in the rank of breeding differentiation of animals. The rank correlation was  $-0.657 \pm 0.377$  and  $-0.388 \pm 0.461$ , respectively.

The individual variety of ewes in terms of the degree of contamination of the inner zone of the staple is quite high. The coefficients of variation for absolute and relative indicators of this trait were 28.5% and 30.4%, respectively. The value of the coefficients of variation slightly decreased with an increase in the ranks of breeding purposes of animals. The

rank correlation was  $-0.371 \pm 0.464$  in absolute terms and  $-0.543 \pm 0.420$  in relative terms. Breeding differentials of the leading groups of ewes are low.

The established regularities indicate that the overall rank value of sheep is determined by other qualitative and quantitative indicators of the wool productivity of animals. The lack of protective properties of the fleece characterises the sheep population as a whole. Therefore, it is necessary to select and make extensive use of outstanding animals in this regard. Breeding traits that determine the consumer and economic value of sheep products are included in the system of conscious genetic improvement through breeding work in the population. Shearing pure wool is the main indicator of sheep's wool productivity. Many researchers emphasise that an insufficient amount of fat in the fleece of sheep leads to a significant deterioration in the natural properties of wool. According to N.M. Korbych & O.M. Salyvonchik (2019), N.M. Korbych & S.Iu. Odnorih (2021), the amount of suint, impurities, and moisture in the fleece affects both the amount of shearing of unwashed wool and the qualitative features of the sheep's coat.

P. Stapai *et al.* (2019) report that reliable protection of the natural properties of wool during its growth, and during primary processing and subsequent use is provided precisely by suint. Thus, a study of quantitative and qualitative indicators of wool suint content was conducted on full-aged sheep of the Askanian fine-fleeced, Prekos, and Ukrainian mountain Carpathian (UMCB) breeds. It was found that the suint of sheep of the Askanian fine-fleeced breed contains 18.4% grease, in the Prekos – 12.9%, and in the UMCB – 8.2%. However, in the suint of UMCB sheep, the proportion of sweat is the highest – 20.6%, in fine-fleeced sheep, its amount is much lower: 15.5% in the Askanian

breed and 12.8% in the Prekos. Individual variations in wool suint are quite significant, which affects the production of high-quality wool (Korbych & Odnorih, 2021).

An important criterion for evaluating the protective properties of sheep suint is the ratio of sweat to wax in its composition. The best protective properties are provided by suint, in which there is less than one unit of sweat per unit of wax. P. Stapai *et al.* (2019) found that in sheep of the Askanian fine-fleeced breed, the wax:sweat ratio is 1:0.84, and in animals of the Prekos and UMCB breeds, respectively: 1:0.99 and 1:2.52. Similar differences were found in relation to the pH of sweat. Thus, the lowest pH values of sweat were found in sheep of the Askanian fine-fleeced breed – 7.8, slightly higher alkalinity of sweat was observed in sheep of the Prekos breed – 8.7, and the highest (9.6) – in the UMCB. By reducing the content of unesterified fatty acids and polar lipids, and increasing the content of unesterified cholesterol and lanosterol, the protective properties of wool wax are improved. The results obtained by I. Korkh *et al.* (2022) suggest that long-term exposure to high air temperature on the body of sheep before shearing can lead to a deterioration of such an important indicator as the yield of washed wool. According to the data, the ratio of parts of wool fat to sweat in unwashed wool turned out to be low and was almost at the same level (desirable for fine-fleeced sheep): one part of fat accounted for from 0.7 to 0.8 parts of sweat.

Now considerable attention of breeders is paid to improving the meat qualities of sheep (Thorne *et al.*, 2021; Suliman *et al.*, 2021). However, wool remains a universal product that enjoys steady consumer demand on the global market (Tsybukh *et al.*, 2021). Researchers and practitioners continue to work on creating new, more competitive breeds and types of

sheep (Masters & Ferguson, 2019). According to N. Boyko *et al.* (2022), the vision of important aspects of the development of qualitative characteristics of wool, including in sheep meat productivity, will contribute to the organisation of measures to manage the processes of using raw materials at the stage of primary processing and improve the technological processes of its processing. The researchers note that the physical and technical characteristics of wool depend on the strategy of managing the breeding process. Failure to consider these parameters with an objective assessment of them can lead to depreciation of fleece, and, ultimately, to a decrease in the level of profitability of wool production.

Therefore, the laboratory studies of wool on the protective properties of Merino fleece allow the authors to objectively evaluate the features and components that form wool shearing in sheep ontogenesis, evaluate the qualitative characteristics of sheep wool cover, and detail the system of animal assessment during valuation. The ultimate goal of breeding is to improve the average level of productivity and adaptation indicators. That is why the use of this rank technique allows controlling the animal assessment system directly in the process of sheep valuation, supplementing it with the value of breeding differentials at the final stages of analysis and selection.

### Conclusions

The proportion of ewes of different breeding ranks is as follows: unique and selective elite – 2.3%, breeding elite – 9.3%, repair elite – 20%, standard and mediocre elite – 40%, first-class standard and mediocre – 21.5%, second-class and rejects – 6.9%. Unique and selective ewes form the basis of the breeding stock to produce outstanding productive breeding rams. The first 4 ranks (31.6%) provide the main number

of repair young stock to replenish the breeding stock of ewes in the herd.

The average indicators for the studied characteristics of the sheep population are: the content of impurities in wool – 17.1%, the degree of depth of contamination, in particular, the outer zone of the staple – 52.5%, the inner zone of the staple – 32.5%. When selecting sheep according to a complex level of productivity, such characteristics as the degree of contamination of the external and internal zones of the staple do not have clearly defined breeding differentials. Increased indicators of the content of mineral impurities in the wool of the best ewes by the rank of breeding purpose were established.

The insufficient level of hereditary capabilities to combine high protective fleece characteristics in the best ewes in terms of the complex level of productivity should be recognised as a disadvantage of the studied flock. The use of this technique allowed forming a unique group of sheep (5% of the herd) to produce outstanding breeding rams. The rank system for evaluating and selecting Merino allows effectively using the gene pool of the sheep population for breeding purposes. The issue of reducing the cost of sheep production by improving production technology and significantly improving domestic sheep breeds in terms of the quality of wool and meat products remains relevant. The prospects for further study are to investigate important components of the qualitative properties of wool quality properties in mutton sheep (using this technique) to successfully implement the process of improving the sheep flock as a whole.

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### Conflict of Interest

None.

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## **Захисні властивості руна вівцематок таврійського типу асканійської тонкорунної породи залежно від рангу селекційної диференціації**

**Василь Михайлович Туринський**

Доктор сільськогосподарських наук, професор  
Національний університет біоресурсів і природокористування України  
03041, Героїв Оборони, 15, м. Київ, Україна  
<https://orcid.org/0000-0002-0312-694X>

**Наталія Василівна Богданова**

Кандидат сільськогосподарських наук, доцент  
Національний університет біоресурсів і природокористування України  
03041, Героїв Оборони, 15, м. Київ, Україна  
<https://orcid.org/0000-0002-4634-9609>

**Петро Ілліч Люцканов**

Доктор біологічних наук  
Науково-практичний інститут біотехнологій в зоотехнії і ветеринарній медицині  
MD-6525, с. Максимовка, Республіка Молдова  
<https://orcid.org/0000-0002-1603-0234>

**Анотація.** Дослідження факторів, що впливають на вологість і забрудненість зовнішньої і внутрішньої зон штапелю, що в подальшому впливає на вихід чистої вовни і її технологічні властивості належить до актуальних проблем тонкорунного вівчарства. Мета дослідження – оцінка захисних властивостей руна вівцематок залежно від рангу селекційної диференціації овець. В основу визначення рангів покладено закономірності нормального розподілу тварин в популяції і показники відтворення стада. Використано 10 рангів. У статті наведено результати лабораторного дослідження вмісту мінеральних домішок і ступеня забруднення штапелю. Проведено розподіл вівцематок на 10 рангів селекційної диференціації. Враховано закономірності нормального розподілу тварин у популяції. Одержані дані свідчать, що різноманітність вівцематок за показниками вмісту мінеральних домішок у вовні дуже велика. Коефіцієнт варіації складає 35 % з коливанням за рангами селекційної диференціації від 13,7 до 38,4 %. При підвищенні групи загальної цінності овець за племінним призначенням величина коефіцієнта варіації зменшується ( $r_s = -0,871 \pm 0,245$ ). При зростанні рангів селекційної диференціації середні абсолютні показники забруднення зовнішньої зони штапелю мають тенденцію до збільшення ( $r_s = +0,257 \pm 0,483$ ), а відносні – зменшуються ( $r_s = -0,600 \pm 0,400$ ). Середній абсолютний показник забруднення внутрішньої зони штапелю складає 3,02 см з коливанням за рангами від 2,83 до 3,29 см. За відносним ступенем забруднення ці показники складають відповідно 32,5 % і від 31,0 до 35,2 %. При зростанні рангу селекційної диференціації вівцематок абсолютні показники забруднення довжини внутрішньої зони штапелю збільшуються ( $r_s = +0,600 \pm 0,400$ ), а відносні мають тенденцію до зменшення ( $r_s = -0,486 \pm 0,437$ ). Індивідуальна різноманітність вівцематок за ступенем забруднення внутрішньої зони штапелю досить висока. Коефіцієнти варіації за абсолютними і відносними показниками цієї ознаки складають відповідно 28,5 і 30,4 %.

Величина коефіцієнтів варіації дещо зменшується при зростанні рангів селекційного призначення тварин. Рангова кореляція складає за абсолютними показниками  $-0,371 \pm 0,464$  і відносними –  $-0,543 \pm 0,420$ . Селекційні диференціали провідних груп вівцематок невисокі. Використання даної рангової методики дозволяє контролювати систему оцінки тварин в процесі бонітування овець, доповнювати її величиною селекційних диференціалів на підсумкових етапах аналізу та відбору; у виробничих умовах формувати технологічні групи вівцематок для одержання видатних баранів-плідників

**Ключові слова:** мериноси; вівці; вміст домішок; ступінь забруднення; штапель; чиста вовна