PLANNING OF DIFFERENT TYPES OF SHEEP CROSS-BREEDING ON THE BASIS OF THE INHERITANCE PATTERNS OF SOME PRODUCTIVITY TRAITS

Planification des différents types de croisement chez les ovins sur la base de l'hérédité des patrons de quelques caractères de productivité

Planificación de diferentes cruzamientos ovinos sobre la base de los patrones hereditarios de algunos caracteres de productividad

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The results of the selection of parents in sheep breeding schemes depend largely on the inheritance patterns of economic value. It would appear that the elucidation of the degree to which economically valuable productive traits are transmitted from parent to offspring could be of theoretical significance to improved selection and more efficient combinations of different breeds in crosses.

Data on the inheritance of valuable economic traits have been differently interpreted in the literature. Further studies and additional experimental data on the inheritance patterns of productivity traits are needed in order to apply them to workable techniques of sheep breeding.

This report concerns a programme developed for more efficient types of sheep crossbreeding basing on the analysis of the inheritance patterns of valuable characters in localities of Siberia where such studies have not been carried out.

The experiments were performed at the Experimental Farm of the Siberian Branch of the USSR Academy of Sciences, near Novosibirsk, on crossbreds of the first generation between dams of the fine-woolled Altai breed and meat-wool rapidly maturing sires of the Lincoln (Argentine) and Romney Marsh breeds and also on crossbreds involving the Altai fine-fleeced × Lincoln × Romney Marsh breeds and the Altai fine-fleeced × Romney Marsh × Lincoln breeds. Data were analysed on the inheritance of live weight, stable length, fibre diameter, weigth of clean wool per skin area, the S/P ratio (ratio of secondary follicles to primary follicles), follicle population density, milk productivity and fertility of ewes, lamb age at weaning as well as some histological features of skin structure.

To exclude the effects of paratypic factors, which is particularly important when analysing such quantitative characters as age, pregnancy, lactation, the

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estimates of the characters of parents and offsprings were obtained in yearlings whose age was arbitrarily taken as 365 days and the data adjusted accordingly. All the experimental animals were fed the same diet and maintained under similar conditions. The estimates for ewes and rams adjusted for the mean estimates of both sexes were taken as means to reduce sex differences. Sheep of the initial parental breeds were typical of each breed.

For growth rate and average daily gain, crossbred lambs from Romney Marsh sires were the best. Yearlings of the first generation (♀ Altai × ♂ Romney Marsh) had mean weights of 51.9 ± 0.64 Kg, while lamb weights at the age of 1 year of three-breed crosses (Altai × Lincoln × Romney Marsh) were 53.3 ± 0.71 Kg, which surpasses significantly lamb weights of (♀ Altai × ♂ Lincoln) crossbreds 47.4 ± 0.58 Kg, and lamb weights of three-breed (Altai × Romney Marsh × Lincoln) crosses, 50 ± 0.58 Kg. It was found that crossbred ewes from Romney Marsh sires had higher milk productivity than fine-woolled Altai or Lincoln ewes. Crossbreds surpassed appreciably their purebred parents in viability. Heterotic effect for live weight, viability, milk productivity and fertility was observed in crossbreds from different schemes of crosses.

Characters increasing wool productivity were analysed in all the progenies: the S/P ratio, follicle production density, staple length, number of days of embryonic life. These characters were found to have intermediate inheritance in all the crosses. However, in the families from some sires (Romney Marsh and as well as Lincoln) crosses to Altai dams, inheritance patterns of staple length departed from the intermediate type. Table I gives the results of the analysis of family data (sire-dam-offspring) for staple length. As seen from this Table, in the progeny of three Romney Marsh rams, No. 8174, 7104, 483, actual staple length and the one expected on the basis of suggested intermediate inheritance are close. However, in the progeny of ram No. 875 whose staple is longer that of other rams (17 cm), staple length in offsprings was actually 11.67 ± 0.17 cm and not 12.25 cm ($P = 0.99$) as expected basing on intermediate inheritance. Staple length in the progeny of ram No. 975 evidences incomplete maternal dominance with respect to this character.

In crosses between fine-woolled dams and Lincoln sires staple length in the progeny of three sires showed intermediate inheritance, while in the progeny of ram No. 7145 actual staple length exceeded the expected length by 0.6 cm ($P = 0.95$). These experimental data suggest that there is incomplete paternal dominance with respect to the inheritance of staple length.

Under the experimental conditions used, the inheritance of fibre diameter by the progeny from crosses between Altai dams and Romney Marsh sires exhibited complete dominance of the paternal breed and, in the case of ♀ Altai × ♂ Lincoln crosses, there was incomplete dominance of the Lincoln breed. As to clean wool yield, both breeds (Romney Marsh and Lincoln) dominated in the first generation, while in three-breed crosses (Altai × Lincoln × Romney Marsh) inheritance was of intermediate type and in sheep of the same age from three-breed crosses (Altai × Romney Marsh × Lincoln) the Lincoln breed dominated.

Data on the inheritance patterns of the main productivity traits subjected to selection have shown that individuals from three-breed crosses rank better as compared with hybrids of the first generation in development, early maturity,

TABLE 1

INHERITANCES OF STAPLE LENGTH IN CROSSES BETWEEN FINE-WOOLLED DAMS AND SIRES OF ROMNEY MARSH AND LINCOLN BREEDS (FAMILY DATA ANALYSIS)

Mean staple length							
Sires		No. of sheep analysed	Dams	F_1 crossbred	Expected staple length in case of intermediate inheritance	Difference between actual and expected length	Inheritance pattern
Animal No.	Staple length (cm)		Mean staple length (cm)	Mean staple length (cm)			
♀ Fine-fleeced × ♂ Romney Marsh							
8174	14.0	34	7.42 ± 0.14	10.97 ± 0.20	10.71 ± 0.07	+ 0.26	Intermediate
7104	15.0	45	7.53 ± 0.16	11.07 ± 0.19	11.26 ± 0.08	+ 0.19	»
483	16.0	38	7.47 ± 0.14	11.34 ± 0.22	11.73 ± 0.07	— 0.39	»
875	17.0	65	7.51 ± 0.12	11.61 ± 0.17	12.25 ± 0.06	— 0.64 **	Incomplete maternal dominance
♀ Fine-fleeced × ♂ Lincoln							
7145	18.0	43	7.30 ± 0.14	13.25 ± 0.27	12.65 ± 0.07	+ 0.60 *	Incomplete
7172	19.0	89	7.44 ± 0.10	13.55 ± 0.18	13.22 ± 0.05	+ 0.33	paternal
867	20.0	86	7.39 ± 0.10	13.72 ± 0.18	13.69 ± 0.05	+ 0.03	dominance
8237	21.0	77	7.57 ± 0.11	14.22 ± 0.21	14.28 ± 0.05	— 0.06	Intermediate
							»
							»

* ($P = 0.95$); ** ($P = 0.999$).

weight, meat quality as well as such fleece characteristics as staple length, fibre fibre diameter and clean wool weight.

Furthermore, when crossbreds are obtained from (Altai × Romney Marsh × Lincoln) crosses, valuable traits of wool productivity (mean diameter attaining 28.9 μ and staple as long as 16-17 cm and, under proper nutritional maintenance, high wool yield of 3.7 Kg) in association with relatively good development were ensured. On the other hand, three-breed crosses (Altai × Lincoln × Romney Marsh) give lambs oustanding in fast development, live weight, and combining improved meat qualities with rather good wool productivity.

SUMMARY

Some data on crosses between Merino sheep with Romney-Marsh and Lincoln sires under Siberian conditions are elucidated.

Mode of inheritance of selected features: wool length, diametre of wool fibres, ratio of secondary to primary follicles, yield of pure wool from area unit and net wool yield in F_1 hybrids and three-breed hybrids are analysed.

Data on the inheritance of basic productive features have shown that three-breed cross-bred hybrids for live weight and for the properties of wool are more valuable animals as compared to F_1 hybrids.

RESUME

Quelques renseignements sur des croisements entre des Merinos avec des Romney-Marsh et Lincoln, sous des conditions sibériennes, sont élucidés.

L'hérédité de traits sélectionnés: longueur de la laine, diamétre des fibres de laine, proportion de follicules secondaires à primaires, production de laine par unité superficielle et production nette de laine chez les hybrides F_1 et les triple hybrides es analysé.

Des renseignements sur l'hérédité des traits productifs ont montré que les hybrides triplés ont plus grande valeur lorsqu'on les compare aux hybrides F_1 pour le poids et les propriétés de la laine.

RESUMEN

Se han esclarecido algunos datos acerca de cruces entre ovejas merinas con moruecos Romney-Marsh y Lincoln en las condiciones siberianas.

Se analizan en los híbridos F_1 y de triple cruce la herencia de la longitud de la lana, diámetro de las fibras de lana, proporción entre folículos secundarios y primarios y producción de lana por unidad de superficie corporal.

Datos sobre la herencia de rasgos básicos de producción han demostrado que los híbridos y triples cruzados son animales más valiosos que los de la F_1 con respecto al peso vivo y a las propiedades de la lana.