The identification of novel SNPs significant for reproductive abilities in sheep using GWAS

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Introduction

Reproductive ability of ewes is one of the most important traits in sheep breeding, because it highlights all physiological process connected to fertilization, fetal development and birth. Hence the mechanisms underlying this complex trait are poorly understood till now.

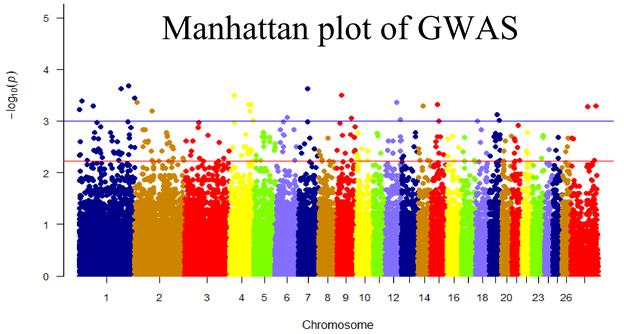
Materials and methods

To study the genetic architecture of litter size and search for SNPs associated with Total lambs born (TLB) we conducted genome-wide association study of Volgograd sheep. A total of 48 sheep after the second lambing were collected: 24 of them had 1 lamb, and 24 others had two lambs. All the samples were genotyped using the OvineSNP50 Genotyping BeadChip according to the manufacturer's protocol. After the quality control 46249 SNPs of 54241 were retained in the working dataset for the GWAS.

Volgograd sheep

Results and discussion

A total of 14 significant SNPs located on chromosomes 1, 2, 4, 7, 15, 18, and 19 reached the genome-wide significance level. More than 50% of SNPs are located in the introns of genes, the rest are located in regulatory regions of genes and intergenic regions. We searched for candidate genes located near the significant SNPs using the Ensembl database. A total of 14 genes were selected.



These genes take part in cellular processes, biological regulation and regulation of metabolic processes, some of them are involved in the formation of the immune system and biological adhesion.

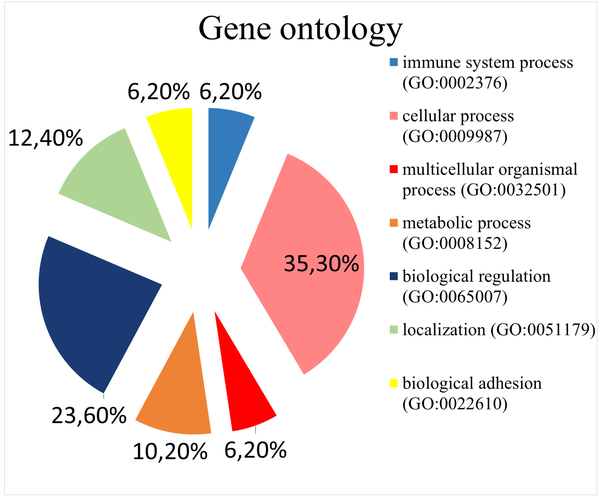


Table. Significant SNPs and their localization

SNP	Chromosome	Position	Gene candidate	Location
rs422563303	1	70044230	BCAR3	Intron
rs418473830	1	85430810	GPSM2	Intron
rs419294730	1	104919388	RHBG	Upstream
rs410904595	1	243372009	SLC9A9	Intron
rs405656989	1	257046798	ATP2C1	Intron
rs420400066	15	40040411	MICAL2	Intron
rs428055749	18	7233159	PGPEP1L	Intron
rs412713787	19	38093997	SYNPR	Intron
rs428775731	19	48091346	ITIH1	Intron
rs412151785	2	12846994	SVEP1	Intron
rs428707226	4	23648876	AGMO	Downstream
rs413282730	4	100824042	DGKI	Downstream
rs430492960	4	116829611	RBM33	Intron
rs402698670	7	43534926	USP3	Intron

Conclusions

The data obtained allowed to determine a number of SNPs that are significant for the formation of such complex reproductive trait as Total lamb born (TLB) in sheep and could be potentially applied in sheep breeding programs.

References

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