

Keywords: Genomic selection; High-throughput sequencing; Marker-assisted selection; Quantitative trait loci (QTL); Genetic variation; Breeding program optimization

Introduction

Genomic selection [1], combined with advanced breeding strategies, represents a revolutionary advancement in modern animal breeding practices. The integration of genomic technologies with traditional breeding methodologies has revolutionized the ability to enhance desirable traits in livestock and aquaculture. By leveraging genomic information, breeders can now make more precise and informed decisions to accelerate genetic gain and address specific challenges in animal production. The advent of high-throughput sequencing technologies has enabled comprehensive

ha been cce fll a lied in b eeding fo di ea e e i ance, mea ali ai , and ada a ion o en i onmen al e o .

High- o gh Se encing (HTS) echnologie ha e facila ed com ehen i e genomic cha ac e i a ion, allo ing fo he iden i ca ion of gene ic a ia ion nde l ing com le ai h o gh a oache ch a genome- ide a ocia ion die (GWAS) and QTL ma ing. HTS ha enabled b eede o n a el he gene ic ba i of heno ic a iabili and nco e no el gene ic ma ke ha can be ed o im o e b eeding acc ac and e cienc [9]. e di c ion al o add e e challenge and con ide a ion a ocia ed i h genomic de e mina ion in animal b eeding, incl ding he need fo ob bioinfo ma ic ool ,da amanagemen em ,ande hicalim lica ion ela ed o gene ic mani la ion. F he mo e, he in eg a ion of genomic echnologie in o b eeding og am nece ia e ongoing alida ion and calib a ion o en e he eliabili and e od cibili of genomic edic ion ac o di e en en i onmen and o la ion . O e all, genomic de e mina ion e e en a an fo ma i e a oach in animal b eeding, o e ing n eceden ed o o ni ie o enhance gene ic gain , e ilience, and ainabili in ag ic l al od c ion [10]. F e e ea ch e o ho ld foc on e ning genomic edic ion model ,e anding genomic e o ce ac o di e e ecie , and add e ing ocio-economic fac o o ma imi e he ado ion and im ac of genomic echnologie in global food ec i and economic de elo men .

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e in eg a ion of genomic de e mina ion in o animal b eeding ha he ed in a ne e a of eci ion and e cienc , igni can l ad ancing o abili o enhance de i able ai and gene ic e ilience in li e ock and a ac l e ecie . o gh o hi e ie , e ha e e lo ed he an fo ma i e im ac of genomic echnologie ch a genomic elec ion (GS), ma ke -a i ed elec ion (MAS), and high- h o gh e encing (HTS) on b eeding a egie and o come .

Genomic elec ion ha eme ged a a co ne one of mode n b eeding og am , enabling b eede o edic he b eeding al e of animal i h n eceden ed acc ac ba ed on genomic info ma ion. B elec ing indi id al ea l in life ba ed on hei gene ic o en ial, b eede can accele a e gene ic gain, im o e od c i i , and add e challenge ch a di ea e e i ance and en i onmen al ada a ion. Ma ke -a i ed elec ion con in e o la a c cial ole, a ic la l fo ai con olled b majo gene o genomic egion . e iden i ca ion and ili a ion of molec la ma ke linked o eci c ai ha e facila ed mo e e cien b eeding fo ai ch a di ea e e i ance, mea ali , and feed e cienc , con ib ing o ainable and economicall iable animal od c ion em . High- h o gh e encing echnologie ha e e ol ionied o nde anding of gene ic a iabili and ai inhe i ance, allo ing fo com ehen i e genomic cha ac e i a ion and he di co e of no el gene ic ma ke . e e ad ancemen o ide al able in igh in o he gene ic a chi ec e nde l ing com le ai , g iding b eeding deci ion and enhancing gene ic di e i i hin b eeding o la ion .

De i e he e ad ancemen ,challenge ch a da a managemen , bioinfo ma ic inf a c e, and e hical con ide a ion o nding gene ic mani la ion emain igni can . Add e ing he e challenge ill be c i cal o ha ne ing he f ll o en ial of genomic de e mina ion in animal b eeding hile en ing gene ic in eg i , animal elfa e, and en i onmen al ainabili . Looking fo a d, con in ed e ea ch and inno a ion in genomic echnologie a e e en ial o o e coming he e challenge and f he accele a ing gene ic gain in animal b eeding. Collabo a i e e o be en e ea che , b eede , olic make , and akeholde ill be c cial in ma imi ing he ado ion and im ac of genomic echnologie on global food ec i and economic de elo men . In concl ion, genomic de e mina ion e e en a a adigm hi in animal b eeding, o e ing n eceden ed o o ni ie o enhance od c i i , e ilience, and ainabili in ag ic l al od c ion. B le e aging genomic in igh and ad anced echnologie , e can mee he e ol ing demand of a g o ing o la ion hile en ing he long- e m iabili of animal ag ic l e.

Ac edge e ,

None

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None

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