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Agricultural Research, Education and Extension Organization
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Research and Education Center

The investigation and genetic and economic comparison of different evaluation and selection methods for breeding of buffaloes in Khuzestan province using computer simulation

Research worker: Bahareh Taheri Dezfuli

Abstract

In this research, in order to provide an appropriate breeding and selection program for Khouzestanian Buffalo, four different selection programs as well as a routine selection program were evaluated genetically and economically using a simulated population of 3000 buffaloes. The selection programs used were as follows: random selection (RS), phenotypic selection (PS), progeny testing (PT) and genomic selection (GS). In each program, different levels of recording (20, 50, 80 and 100%) and artificial insemination (20, 50, 80 and 100%) were used. Population and programs were simulated using R program. Also, the economic value of some production and reproductive traits was estimated, and the selection index consisting of two traits of milk production and fat percentage based on the sales situation of milk and local cream was used in selection programs. Comparison of the studied programs was carried out based on parameters such as genetic progress, production and total genotypic value changes, as well as the inbreeding coefficient and the income and cost of each program. Based on the results, the economic values for milk yield in milk and local cream sale and only milk sale situations were estimated as 16774 and 15996 Rials, respectively. The economic value obtained for fat percentage in the milk and local cream sale situation (178011 Rials) refers to the importance of this trait for buffaloes. The calculated total profit refers to the high correlation between milk yield income and profit of the herds, especially in milk and local cream sale situation. In the cost-benefit analysis, profitability for calves was negative, but in contrast, the profitability of fattening calves was positive for each buffalo cow per year. This suggests that sales of fattening calves can lead to the profitability of buffalo breeding. In selection programs analysis, as the numbers of herds enrolled in artificial inseminating programs increased, phenotypic selection and progeny test programs increased genetic improvement and genotype value changes. This increase was achieved more for the progeny test program, due to the use of more accurate information as well as the genetic evaluated sires. Changes in the total genotypic value in progeny test programs were more than the phenotypic selection programs, indicating that the selection programs would be more productive using the progeny test. This trend was also observed for the cost and revenue from the implementation of each of the programs for the studied buffaloes. In addition to artificial insemination, the recording system was also effective in increasing the cost and income of herds. In

most progeny test programs, the additional costs of using the recording system and artificial insemination operations were offset by increasing the milk yield of buffaloes. In the progeny test program, as the number of active males increased, the number of young males increased, so the duration of active male replacement was also increased. As a result, the inbreeding rate for the population under the artificial insemination program has also increased with increasing levels of artificial insemination. Based on changes in total genotypic value, genetic progress of milk production, the minimum cost and the maximum income, the progeny test program with 20% covered population by recording and 100% of population under artificial insemination was selected as the appropriate program for the studied population, among the proposed programs. Comparing the use of genomic evaluation and classic evaluation in choosing male buffaloes with 100% artificial insemination of the population, the results showed that genomic evaluation could lead to increase genetic improvement as well as decreasing the average of inbreeding coefficient in buffalo breeding program. Also, in comparison of genomic evaluation programs costs with different levels of artificial insemination of the population, whole costs increased by increasing artificial insemination levels, and the highest cost and income was obtained for genomic selection program with 100% artificial insemination level. In genomic selection, genotyping cost is the highest share of costs, which has increased with increasing artificial insemination costs in the studied population. Generally, economic calculations in this section showed that genomic evaluation, despite its high investment and maintenance costs, is more economical in terms of benefits than classic evaluation in choosing male buffalo.

KeyWords:buffalo, Khuzestan, progeny test, genetic progress, income, economic value and breeding program.