A REVIEW: RESEARCH PROGRESS OF CROSSBREEDING OF ARKHAR-MERINO WITH LOCAL BREEDS IN IRAN

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BACKGROUND
The greatest part of the wool produced by the indigenous sheep breeds in Iran is used in the hand woven carpets. It is estimated that 5.1 million m² hand woven carpets is produced in Iran annually, therefore the country needs 28 thousands tons of washed wool. Approximately 8 thousand tons of wool is imported as merino wool from Australia and New Zealand. Iranian wool is suitable for use in coarse-carpet industry, but it has some difficulties for use in the fine carpets. Fine carpet makers usually utilize imported wool which has more uniformity of diameter. For finding suitable sheep breed to produce more uniform wool, we interests to Arkhar-Merino breed at University of Tabriz. The Kazakh ArkharMerino breed initially was produced at Kurmektinski experiment station of the Academy of Sciences of the Kazakh. The breed is based on crossbreeding of wild Arkhar rams with ewes of the Novocaucasian Merino, Précoce and Rambouillet breeds (Ernst and Dmitriev, 2007). ArkharMerino breed has been imported to Iran from Kazakhstan. The purposes were: a) to develop a new sheep project, at Khalatpoushan Research Centre; b) to obtain information about crossbreeding of local fat-tail rams with Arkhar-Merino ewes regarding the wool and meat traits. Several crossing experiments in sheep are currently in progress. Most of them are based on local breeds. It is expected that crossbreeding can lead to combination of favorable characteristics from ArkharMerino.

Wool: main-findings. Rafat and Shodja (2002) showed that with crossbreeding between ArkharMerino and Ghezel breeds, ratio of secondary to primary follicles increases in crossbred lambs (Photographs 1 & 2). Shodja et al. (2004) studied wool characteristics of Arkhamerino-Ghezel and Arkhamerino-Moghani crossbred lambs at first generation. Means (± standard error) of fleece weight, fiber diameter, variability of fiber diameter, staple length, kemp and modulated fibers percentage in Arkhamerino-Ghezel were 1281.92 ± 33.37 gr, 27.46 ± 0.53 μ, 39.09 ± 1.26 %, 15.12 ± 0.49 cm, 0.67 ± 0.25 % and 5.71 ± 1.17 %, respectively. The same traits in Arkhamerino-Moghani were 1355.56 ± 62.48 gr, 26.17±0.91 μ, 44.88 ± 2.3%, 13.37 ± 0.6 cm, 3.21 ± 0.55 % and 11.26 ± 1.71%, respectively. The effects of genotype and birth type were assessed on fleece characteristics by using least square procedures. The genotype had effect (P<0.05) on variability of fiber diameter, staple length, kemp percentage and modulated fibers. Arkhamerino-Ghezel ewes had lower variability, kemp and modulated fibers than Arkhamerino-Moghani ewes.

In order to evaluate fleece characteristics, wool samples of 451 yearlings of Arkharmerinos×Ghezel (ArGh) and Arkharmerino × Moghani (ArMo) were collected by Mokhber et al. (2008). At first generation of ArGh, mean (± standard error) of fiber diameter, fiber diameter variability, staple length and percentage of true wool, medulla and kemp percentage were 27.10 ± 3.36 μ, 36.60 ± 7.84 %, 11.81 ± 4.06 cm, 91.31 ± 9.32%, 7.27 ± 6.90%, 1.40 ± 3.03 %. At second generation of ArGh, the same traits were 26.33 ± 3.41μ,
34.64 ± 9.36 %, 10.15 ± 3.99 cm, 95.41 ± 4.70 %, 3.39 ± 5.85 % and 2.01 ± 2.65 %, respectively. At first generation of ArMo, mean (± standard error) of fiber diameter, fiber diameter variability, staple length and percentage of true wool, medulla and kemp were 26.18 ± 4.11 μm, 36.19 ± 8.63 %, 10.95 ± 3.34 cm, 88.90 ± 9.28 %, 8.81 ± 7.76 %, 2.27 ± 2.47 %. At second generation of ArMo the same traits were 26.99 ± 3.7 μm, 36.52 ± 14.5 %, 10.09 ± 2.92 cm, 94.60 ± 6.36 %, 3.24 ± 4.52 % and 2.85 ± 4.99 %, respectively. Results showed that Fleece quality of second generation has minimum standards for use in carpet and textile industry. There are still some needs for further research into develop this crossbreeding system.

Esfandyari et al. (2009) compared performances of Arkharmerino × Ghezel and Arkharmerino × Moghani crossbreed lambs during two years (2007-2008). Each sample was measured for average fibre diameter, fibre diameter variability, staple length, proportion of medullated fibre, proportion of kemp, and comfort factor. The least square means (± SE) for these fleece characteristics in F3 Arkharmerino×Ghezel were 28.78 ± 0.48 μm, 36.84 ± 1.16 %, 11.94 ± 0.35 cm, 7.07 ± 0.93 %, 1.02 ± 0.23 % and 68.93 %, respectively. The least square means (± SE) of same traits in Arkharmerino×Moghani were 29.79 ± 0.43 μm, 41.86 ± 1.16 %, 11.96 ± 0.37 cm, 8.13 ± 1.06 %, 2.71 ± 0.45 % and 63.33 ± 3.66 %, respectively. The results showed crossbreeding of local breeds with Arkharmerino have positive effects on the fleece characteristics.
Shodja et al. (2009) measured wool samples of ArkharMerino × Ghezel ewes (Table 1). The averages of staple length were similar to that reported by Mokhber et al. (2008) for ArkharMerino and Ghezel breeds and their crosses.

Table 1: Staple length (cm), fibre diameter (μm), fibre diameter variability (%), kemp (%) and medulation (%) of ArkharMerino×Ghezel ewes sampled at the right mid-side.

<table>
<thead>
<tr>
<th>Fleece Properties</th>
<th>Mean ± SE</th>
<th>CV</th>
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<tbody>
<tr>
<td>Staple length</td>
<td>11.40±0.42</td>
<td>25.56</td>
</tr>
<tr>
<td>Fibre diameter</td>
<td>24.30±0.55</td>
<td>10.50</td>
</tr>
<tr>
<td>Fibre diameter variability</td>
<td>32.17±0.78</td>
<td>22.77</td>
</tr>
<tr>
<td>Kemp</td>
<td>1.55±0.32</td>
<td>28.20</td>
</tr>
<tr>
<td>Medulation</td>
<td>2.67±0.44</td>
<td>26.21</td>
</tr>
</tbody>
</table>

Gene polymorphism. Shodja et al. (2000) prepared the G-banded karyotype of ArkharMerino sheep from blood lymphocytes. Results showed that each karyotype consisted of three pairs of biarmed and 23 pairs of acrocentric autosomes.

Beta-Lactoglobulin is the major milk whey protein that has been recognized in the ruminants. The BLG coding gene located on ovine chromosome 3. Studies have indicated that this protein is polymorphic in the many breeds of sheep. This is the result of a single base pair substitution in the Beta-Lactoglobulin gene that also rises to the Rsal restriction fragment length polymorphism (RFLP). The genotype distribution of Beta-Lactoglobulin in sheep was analyzed. The frequency of A-allele in Ghezel, Afshari, Moghani, Makoi and Arkharmerino breeds was 56 %, 34 %, 36 %, 53 % and 48 %, respectively. The population of ArkharMerino was in Hardy-Weinberg equilibrium (Elyasi et al., 2005b).

Mohammadi et al. (2006) studied genetic polymorphism of β-lactoglobulin in Arkhamerino and found Arkhamerino (0.57) breed had the most frequent AB genotype. In Arkhamerino breed, Elyasi et al. (2005a) have described a two alleles system of polymorphic variants (M and N) in a region of the ovine CAST locus by PCR-RFLP method. They reported an allele frequency of 69%, 48% and 50% for the M allele in Ghezel, Arkhar Merino and Ghezel × Arkhar Merino breeds, respectively.

Growth traits.

Average birth weight. The average (±SE) birth weight of Ghezel x ArkharMerino, Moghani x ArkharMerino, Makoi x ArkharMerino, Baluchi x ArkharMerino, were 4.13 ± 0.09, 4.31 ± 0.18, 3.89 ± 0.14 and 4.33 ± 0.18 , respectively.

Carcass weight. The average (±SE) cold carcass weight of Ghezel x Arkhar-Merino, Moghani x Arkhar-Merino, Makui x Arkhar-Merino, Baluchi x Arkhar-Merino, were 27.58 ± 0.47, 26.87 ± 0.52, 26.39 ± 0.57 and 28.30 ± 0.85 , respectively.

Ability of measurement on carcass of Arkhar-Merino x Moghani investigated for estimation of carcass composition and anatomic parties (Photograph 3). The aim was to find the relationship between the measurements on carcass and important butcher’s qualifies. Correlation between traits, and regression between meat to bone ratio was calculated by stepwise method. Results showed a negative correlation between bone diameter and meat to
bone ratio. A regression was calculated between the ratio of meat to bone, and carcass length, leg’s length and bone diameter. These results can be utilised in evaluation of carcass conformation by indirect methods in breeding programmes (Rafat et al., 2009).

**Lamb Production.**
- The *Ghezel* crossbred lambs grew faster than the *Merino* lambs.
- The *Ghezel* lamb carcasses carried less fat than *Ghezel* crossbred.

**CONCLUSION**
Two important native breeds of Iran (*Ghezel* and *Moghani* breeds) have some difficulties in wool traits. A review of all studies that have been conducted in Tabriz during last decade (2000-2009) showed the potential of these breeds in crossbreeding with *ArkharMerino* breed to produce more uniform wools. This paper presented a summary of the principal studies conducted on *ArkharMerino* sheep in Iran related to crossbreeding with local breeds. Some of the results highlighted here, showed the progress of this crossbreeding projects in terms of improvement of wool traits.

**REFERENCE**


Esfandyari H, Shodja J, Rafat SA, Dorostkar M 2009. An Investigation on fleece characteristics of *Arkharmerino × Ghezel* and *Arkharmerino × Moghani* crossbreed sheep in third generation. NATURAL FIBRES IN AUSTRALASIA. Combined (NZ and Aus)


