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# Effects of Crossing Finnrams with Awassi Sheep on Prolificacy and Other Quantitative Traits

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**Abstract:** An experiment lasting almost 10 years was conducted to investigate the effects of crossing 6 Finnish landrace rams with 60 Awassi ewes on prolificacy and other traits using (A.I.) first generation was produced (50% Finnawassi). Blood samples were taken for haemoglobin typing. Finnawassi ewes were back crossed to produce 75% Finn and 25% Finnawassi. A comparison was done between different Finncrosses on suitable crossbred generation in sustaining sub-tropical conditions and heat-tolerance; prolificacy, growth and conformation. Twining % in local Awassi was increased from 5 to 35% within 9 generations (+30%). Crosses of 50 and 25% Finnawassi were found more suitable for local sub-tropical prevailing conditions than 75% Finncross. These were lower tolerance to hot and harsh conditions, suffer higher mortality and less hardiness than other crosses. Although 1st generation lambs had significantly lighter weaning weights ($P<0.05$) than local Awassi (20.4 vs 24.3 kg). However, Finnawassi had much better growth rates than Awassi (264 vs 221 gm perday). Tail length in Finnawassi was reduced significantly by >26% (20.9 vs 15.4 cm) and tail width was also reduced significantly by >48%. It is concluded that it is worth crossing local Awassi with prolific (i.e Finnsheep) breeds to improve prolificacy, growth rate and reduce tail size in 50 and 25% Finncrosses under well managed farms.

**Key words:** Finnawassi cross, prolificacy, fatty tail size, heat tolerance

## Introduction

Comparing with sub-tropical awassi sheep and other middle east breeds, Finnsheeps are famous in many quantitative characters such as: high ovulation rate (3.5-4.9) and exceptional prolificacy (more than 30% of triplets births). Moreover, they have reasonably long breeding season, medium wool quality and characterized with very short tail (Maijala, 1967; Bindon ***et al.***, 1995; Aboul-Naga, 2000). On the other hand, Finnsheep as a temperate breed is a lower tolerance to prevailing hot conditions than local sub-tropical sheep (Aboul-Ela ***et al.***, 1987).

Finnsheep and other prolific breeds i.e. romanov and daman, can be used in the half-bred or Quarter-bred form, depending on the level of prolificacy and other reasons including the best heat tolerance cross (Bindon ***et al.***, 1995). Olthoff and Boylan (1991) found when using ½ or ¼ Finncrossbred ewes, the possibility of taking advantage of increased reproductive capacity in the ewe associated with good lamb performance. Crosses of ¼ Finn were found similar to the local Egyptian breeds in their adaptability to the prevailing sub-tropical condition in Egypt (Aboul-Naga, 2000). On the other hand, Awassi sheep is characterized by ordinary lambing rates ranging from 0.92 for single lambing peryear to 1.06 for twice lambing peryear (Al-Rawi and Shujaa, 2000) and low prolificacy rates ranging from 105.6-110.0% (Ghazal and Al-Saigh, 1980).

Awassi ewes were found to have a long breeding season and have the ability to breed all year round (Al-Wahab ***et al.***, 1982). Awassi conformation is different than that of Finnsheep, having a big fatty tail enables these local sheep sustaining scarce of food during dry hot seasons. These animals have a very good adaptability and heat tolerance to common extreme hot conditions. Moreover, Awassi rams showed high summer fertility during their traditional summer mating seasons (Al-Wahab ***et al.***, 1987).

The idea of this long term research came to improve the fertility, prolificacy, growth rates, live weights and body conformations (reducing their fatty tail size to match consumers demands) in a new cross bred suitable for sub-tropical conditions.

**Materials and Methods**

This breeding project was conducted at Abu-Graib during the period 1978-1987, Baghdad area (latitude 33.7°N) and lasted for almost 10 years. Six mature pure imported Finnish landrace rams were introduced to 60 Awassi ewes aged 2-3 years. Ewes were synchronized for oestrus using progesterone sponges before the introduction of Finnrams. Ewes came to oestrus but Finnrams failed to mate them naturally because of the big fat tail of oestrual ewes and the differences of both genotypes in body conformations, therefore, Finnrams were trained for semen collection. Awassi ewes were artificially inseminated using 0.2 cc undiluted fresh semen. First generation of cross bred (50% Finn Awassi) lambs were produced. The first hybrid ewes were either back crossed to the Finnrams to produce cross bred ewes (¼ Awassi, ¾ Finn) or mated to Awassi rams to produce a quarter Finn (¼ Finn, ¾ Awassi), these were intermated for many generations together with (½ Finn, ½ Awassi) but ¾ Finnawassi ewes were intermated for very limited generations because of their lower tolerance to prevailing hot and harsh conditions. Body and tail measurements were taken from animals including: heart girth, body length, height, cannon bone length and circumference (tail size).

Blood samples were collected from local breeds (awassi and hamdani), pure Finnrams and 50% cross bred Finnawassi for haemoglobin type determination using the ordinary (gel electrophoresis).

Other information were also considered such as: survival and mortality rates, heat tolerance, hardiness ageing and mothering abilities of cross bred ewes. Data were analyzed using least significant difference and general leanear models, using Duncan's multiple range test (DMRT) for testing the different variables.

## Results and Discussion

### Haemoglobin type

Animals were classified into three blood-types: A, B and AB. Four Finnrams were found from A-group (Table 1). All local breeds including awassi and hamdani sheep were from B-type. On the other hand 34 Finnawassi (about 60%) were from B-type and another 23 Finnawassi (40%) were from AB-type. Ten unknown samples showed B-type as well. These results may indicate a type of a relationship between the transmission of A-type shown in these animals (40%) and the genes responsible for prolificacy as a quantitative character of low heritability. This postulation may explain why it takes about 9 years to increase twinning percentage from 5 to 35%. Vanhaandel and Visscher (1995) estimated heritabilities for litter size at birth and at weaning as 0.16 and 0.08, respectively.

### Prolificacy and fertility

Twinning was only 5% in the original awassi flock (Table 2). It had reached > 35% within 9 years of crossing and intermating with Finn and Finn crosses. Schoeman ***et al.*** (1993) introducing Finnish genes to indigenous Dorper sheep of South Africa. Number of lambs born per lambing had increased from 1.08 in Dorper to a range of 1.35-1.48 per lambing.

Notter and Mcclaugherty (1991) found better prolificacy in ¼ Finn, ½ Suffolk, ¼ Rambouillet than in ½ Suffolk, ½ Rambouillet (1.83 vs 1.55), Iman and Slyter (1996) comparing ¼ Finn, ¼Dorset, ½ Targhee with pure Targhee. Finn-Dorset-Targhee had higher prolificacy (2.11 vs 1.75), weaned more lambs per ewe exposed (1.41 vs 1.18) and produced more total lamb weight weaned

Table 1: Results of haemoglobin typing in Finnrams, local sheep and Finnawassi crosses

| Hb-type | Awassi No. | Hamdani No. | Pure finnish No. | Finnawassi No. | Unknown No. |
|---|---|---|---|---|---|
| A-type | - | - | 4 | - | - |
| B-type | 73 | 23 | - | 34 | 10 |
| AB-type | - | - | - | 23 | - |

Table 2: No. of local awassi and Finnawassi ewes lambing twins in different lambing seasons

| No. of ewes lambing | Breed | Year | No. of ewes lambing twins | Twinning% |
|---|---|---|---|---|
| 60 | Awassi | 1978 | 3 | 5 |
| 24 | Finnawassi | 1983 | 4 | 16 |
| 22 | Finnawassi | 1984 | 5 | 22 |
| 39 | Finnawassi | 1985 | 10 | 25 |
| 34 | Finnawassi | 1987 | 12 | 35 |

per ewe exposed (33.8 vs 29.9 kg) than Targhee. Aboul-Naga (2000) crossing Finnsheep with Egyptian breeds resulted in an increase in prolificacy from 1.15 in local breeds to 1.65 in ¼ Finn crosses. Bindon ***et al.*** (1995) had cited the litrature and tabulated breeds, litter size and relative gain in prolific cross (Table 3).

**Growth Parameters and measurements**

Data indicates both birth and weaning weights and some other growth parameters including growth rates and size of fatty tail in pure awassi and ½ Finnawassi lambs (Table 4). Although awassi lambs were slightly heavier (N.S.) at birth than Finnawassi; there was a significant difference (P<0.05) at weaning in favour of awassi lamb, they were 24.3X20.4 kg for awassi and Finnawassi, respectively. Shrestha and Heaney (1992) found Finnsheep lambs had significantly lower birth weights at 56 days and at weaning than local Canadian breeds. Vanhandel and Visscher (1995) found significant genetic differences between different Finncrosses traits; Finnish

Table 3: Improvement in prolificacy by crossing with Finnsheep

| Breeds | Mean litter size | Gain in prolificacy | References |
|---|---|---|---|
| Merino | 1.00 | +70 | Land ***et al.*** (1974) |
| Merino X Finnsheep | 1.70 | | |
| Galway | 1.41 | +41 | Hanrahan (1974) |
| Galway X Finnsheep | 1.99 | | |
| ¼ Finn, ½ Suffolk, | | | |
| ¼ Rambouillet | 1.83 | +28 | Notter and Mcclaugherty (1991) |
| Targhee | 1.45 | +48 | Iman and Slyter (1993) |
| Finn-Dorset-Targhee | 1.93 | | |
| Awassi | 1.05 | +30 | Al-Wahab (2002) |
| Finn X Awassi | 1.35 | | |

Table 4: Comparison in some growth characters in awassi and Finn x awassi cross lambs in first lambing season

| Breed | Birth weight (Kg) | Weaning weight (kg) | Growth rate (g) | Tail length (cm) | Tail width (cm) |
|---|---|---|---|---|---|
| Awassi | 3.7±1.1a | 24.3±5.2a | 221±36.1a | 20.9±7.3a | 16.5±7.9a |
| Finn Awassi | 3.5±0.79a | 20.4±8.0b | 264±79.8b | 15.4±1.5b | 8.5±1.9b |

**Table 5: Birth weights and body weights development as a growth indicator at different ages**

| **Birth date** | **Birth weight** | **Weighing dates** | | **Body weight changes (kg)** | | **weighing dates** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ♀ and ♂ | (kg) | 8/3 | 23/3 | Weaning wt. | Cross type | 12/12 | 16/1 | 13/2 | 5/3 | 14/3 | 21/3 |
| | 3.01±6.1 | 7.3±2.7 | 12.1±4.9 | 21.7±5.0 | 50% | 47.4±7.3a | 47.7±6.8a | 50.5±6a | 47.5±4.1a | 49.5±4.9a | 46.3±8.7a |
| 1/3/1982 | | | | | 25% | 40.9±6.9b | 40.5±6.4b | 43.1±4.9b | 43±4.3ab | 45.4±6.1b | 42.4±6.7ab |
| | | | | | 75% | 40b | 39.5b | 40b | 39.5b | 39c | 39b |

* Means±5.D with different superscripts in the same column are significantly different at P<0.05

maternal effect decreased significantly average lamb weights at birth and at weaning. Similarly, Iman and Slyter (1993) they found ¼ Finn, ¼ Dorset, ½ Targhee (FDT) lambs were lighter at weaning but these (FDT) ewes weaned 5.8 more total lamb weight per ewe exposed than did pure Targhee ewes. In this experiment the overall Finnawassi growth rates were significantly higher than that local awassi ($P<0.05$). They were 264 and 221 g, respectively. Burfening and Carpio (1995) found ½ Finn-Targhee significantly increased growth rate and fleece production but had lower survival rates of their lambs.

Tail length and width had decreased significantly ($P<0.05$) in the first cross bred generation (1/2 Finnawassi). It is clear from the information of tail measurements (Table 4, Fig. 1) that the tail length had decreased by one third and tail width by a half comparing with those of pure awassi lambs (Fig. 3).

Table 6: Body measurements and weights of Finn Awassi crosses (50%) of different ages

| | Type of cross | | |
|---|---|---|---|
| | 50% Finn awassi♀♂ | 50% Finn Awassi♀ | 50% Finn Awassi♂ |
| Age (mth) | 3 | 18±1.3 | 20±7 |
| Weight (kg) | 17.1±3.5a | 30.6±16.8b | 30.8±9.9b |
| **Cannon bone** | | | |
| Length (cm) | - | 13.8±1.3a | 14.1±0.7a |
| Circum. (cm) | - | 7±1.0a | 6.7±0.5a |
| Tail size or shape | Triangle shape | 13.3±2.5a | 16.6±4.5b |
| Tail width (cm) | 8.3±2.0a | 9±1.0a | 8.8±2.2a |
| Tail length (cm) | 15.3±1.5a | 18.6±2.0b | 19.7±3.0b |
| Heart girth (cm) | 66.4±14.7a | 75.0±14.1ab | 78.7±9.5b |
| Height (cm) | 53.1±6.2a | 61.0±8.9b | 61.0±6.3b |
| Body length (cm) | 51.6±9.1a | 62.3±12.8ab | 66.3±6.4b |

Fig. 1: A young 50% Finnawassi with it's first offspring

Fig. 2: A group of 75, 50 and 25% Finncrosses lambing ewes

Results of tail measurements of this experiment of local Awassi lambs were rather similar to those found by Elya (1969). He found tail length and width (cm) in Awassi males and females yearlings were (21.7 vs 14.3) and (18.5 vs 12.2), respectively.

Epstein (1985) described fat tail improved awassi sheep as: broad and short; he found fat tail width in male lambs yearling ewes and adult ewes were 18.4, 20.1 and 23.5 kg, respectively. Data showed the growth developments in spring born (50, 25 and 75%) Finnawassi cross bred lambs from birth to weaning in one of the lambing seasons and their monthly live weight changes through the subsequent year (Table 5).

It is clear from the results that the 50% Finnawassi cross bred sheep are heavier in their live weights ($P<0.05$) than both 25 and 75% Finnawassi crosses which may presumably indicate clearly the effect of hybrid vigour in first generation cross of half Finn blood compared with both backed cross sheep to either 25 or 75% Finnawassi crosses (Table 5).

Table 7: Comparison of body measurements and weights of other crosses (75, 50 and 25% Finn awassi)

| | | | Cannon bone | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type of cross | Age (mth) | Weight (kg) | Length (cm) | Circum. (cm) | Tail size or shape | Tail width (cm) | Tail length (cm) | Heart girth (cm) | Height (cm)` | Body length (cm) |
| 50% Finn awassi♀ | 24±0.75 | 42.1±6.8a | 14.3±0.7a | 7.5±0.5a | 16.9+1.9b | 10.3±1.5b | 18.1±1.5b | 89.5±8.3a | 68.4±4.1a | 73.0±6.1a |
| 50% Finn awassi♀ | 30±0.6 | 44.7±9.8b | 14.7±0.9a | 7.6±0.6a | 17.9±4.7b | 11.2±3.8b | 22.2±1.1a | 90.9±8.2a | 67.7±6.0a | 70.6±3.0b |
| 25% Finn awassi♀ | 24.0 | 39.0±6.7bc | 15.4±0.5b | 8.0±4.0ab | 24.3±5a | 21.8±5.6a | 20.0±2.4a | 87±6.3a | 67.3±2.5a | 72.7±5.9b |
| 25% Finn awassi♀ | 28.0 | 38.6±14.2b | 15.7±0.6b | 7.8±0.8ab | 21.8±2.8b | 15.0±6.0b | 22.0±2.0a | 88.3±7.6a | 67.3±2.5a | 72.0±7.2b |
| 25% Finn awassi♀ | 30.0 | 41.9±5.2c | 14.8±0.6a | 7.6±0.4a | 27.4±5.6a | 23.8±3.1a | 22.4±1.1a | 89.2±8.7a | 68.5±0.86a | 71.0±4.5b |
| 25% Finn awassi♀ | 32.0 | 51.4±5.5a | 14.2±0.9a | 7.5±0.5a | 27.5±1.4a | 21.0±4.3a | 16.8±2.1b | 95.0±5.0b | 67.7±6.0a | 76.5±5.9a |
| 75% Finn awassi♂ | 30.0 | 55.0a | 14.0a | 7.0a | 12.0c | 9.0c | 19.0a | 89.0a | 76.0a | 78.0b |
| 75% Finn awassi♀ | 24.0 | 39.0b | 14.0a | 7.0a | 10.0c | 7.5c | 8.0b | 82.0b | 68.0b | 70.0b |
| 75% Finn awassi♀ | 12.0 | 26.0c | 14.0a | 6.5a | 12.0c | 9.0c | 18.0a | 69.0c | 55.0c | 64.0a |

Table 8: Lambing Results of intermating within the crosses 50, 25 and 75% in 1984

| Sex | Type of cross | Birth weight (kg) | Weaning weight (kg) | Weight at 30/4 (kg) |
|---|---|---|---|---|
| ♂ | 50% | 2.7±0.8a | 19.2±2.3cb | 33.5±16.3c |
| ♀ | 50% | 3.1±0.7ab | 21.3±8.7b | 37.1±9.2b |
| ♂ | 25% | 2.3±0.6a | 26.0±0.9a | 40.0a |
| ♀ | 25% | 3.3±0.5b | 23.0±7.2b | 27.2±10.4d |
| ♀ | 75% | 3.6b | 18±3.6c | 26.1±2.5d |

* Means±S.D with different superscripts in the same column are significantly different at $P < 0.05$