

Observations on Reproduction and Production Traits of Goats Maintained on Rangelands of Baluchistan**M. Rafiq, M. Munir, M.J. Afzal and A. Ali***Animal Sciences Institute, PARC, Islamabad, Pakistan
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OBSERVATIONS on reproductive and productive traits of kijli and kharasani goats maintained under semi-arid or arid ranges of Baluchistan were recorded. The major grass species contributing to the plant biomass of semi-arid range were *Cymbopogon jawarancusa* and *Chrysopogon aucherii*. Approximate vegetation cover was 35-40%. Arid ranges of western Baluchistan were dominated by shrubby vegetation mainly *Artemisia maritima* and *Holoxylon griffithii*. The conception rates were 88 and 79 and kidding rates were 75 and 58% in does of kijli and kharasani breeds respectively. The liveweight of does and kids at kidding was significantly different ($P < 0.5$). The liveweight gains of does during lactation was 104 and 40 g/day for kijli and kharasani breeds which were highly significant different ($P < 0.1$). Kids of kijli breed, gained liveweight at a rate of 108 g/day which was highly greater ($P < 0.1$) than that of kharasani kids growing at 68 g/day. The liveweight of kids at weaning was significantly different ($P < .05$). Differences in milk yield of both breeds were highly significant ($P < .01$). The productivity of ranges and subsequent changes in liveweight during various seasons and measures for the improvement of ranges are discussed.

Key words: Goats, Rangelands, Pakistan, Reproduction, Production.

Due to low and erratic precipitation, approximately 93% (GOB, 1986) of the total land area of Baluchistan is arid or semi-arid and simply. Offers grazing potential for sheep and goats. Although sheep dominate but goats are equally important and contribute in the pastoral economy of the farmer as well as the province through the production of mutton, milk, skins and hair (Gall, 1975, McDowell, 1976 and Devendra and Owen, 1983). This is possible because goats have the capability to thrive and produce under an

environment where feed and water sources are scarce (Malechek and Provenza, 1983). In spite of this biological and socio-economic role played by goats, this valuable species of livestock has been subjected to a myth as being claimed as a destructor of forest and rangelands (French, 1970). Increasing human population, limited natural resources and changes in pastoral cultures, necessitate for a scientific management of this species. Before formulating a strategy for the exploitation of potential of goats, reproductive and productive traits of biological as well as economic significance need to be studied. The following study, thus was conducted on two breeds of goats found in Baluchistan under contrasting climatic conditions.

M a t e r i a l a n d M e t h o d s

Two locations were selected for conducting the experiment. One was at Zarchi, located 20 km west of kalat, a representative of the arid environment in southern Baluchistan. Other at Tomagh, situated 15 km west of Sanjawi in loralai district, was representative of semi-arid environment, in northern Baluchistan, Both sites are at an altitude of 1800 meters. Meteorological data was recorded throughout the year.

Type of vegetation and major species of shrubs ; trees and grasses were also studied. Dry matter production of both experimental locations was estimated with the use of "Clip-Quadrat" method. A rectangular quadrat (0.8 × 1.25 meter) was used to minimize the variations likely to occur in plant composition. Samples of Palatable plant species were taken, weighed and dried out at 90°C and the residue was calculated as dry matter.

Twenty five yearling goats each of kharasani and kijli breeds found in zarchi and Tomagh regions, respectively, with uniform size and weight, were randomly selected and placed on the experimental locations. Goats were maintained under conventional husbandry system. They were allowed to graze for almost 6-8 hr daily under routine practices, in respective regions throughout the year. However, during winter because of rainfall animals were fed with wheat straw ad-libitum and barley grain at the rate of 250 g/head/day. Palatability value of different range plants was determined with "Bite-count" method. For bite counting, telescopic observations were recorded.

Does at both locations, were hand milked daily and milk was measured and fed to respective kids. Does as well as kids were weighed at breeding, kidding and fortnightly intervals during lactation.

Results and Discussion

The mean rainfall at the zarchi experimental location was recorded 200 mm per annum. 90% of this rainfall occurred during winter-early spring. At Tomagh, 300 mm rainfall was recorded which was distributed 60% in winter and 40% in summer, season, temperature at zarchi varied -15 to 40°C as compared with -4 to 35°C at Tomagh.

The Zarchi location was observed as representative of shrubland dominated by *Artamisia artima* and *Haloxylon griffithii* Total shrub cover was estimated as 10 - 15%. The vegetation available at Tomagh was mixed one, shrub-grassland range with more than 50% of woody species. *Cymbopogon jawarancusa* and *Cheysopogon aucheri* were the major grass species in this area. Among woody species *Olea cuspidata*, *istacia khinjuk* *prunus aburnea* and *Ebernus stelletus* were commonly found. Vegetation cover of this site was 30 - 35%. Major species of trees, shrubs and grasses available at both locations are given in Tables 1, and 2.

The grazing behaviour or goats preference toward particular species of vegetation, measured with "bite-counting" revealed that trees, shrubs, grasses and forbs contributed at the rate of 20, 65, 15 and 0% in the diets of goats maintained at Tomagh. The contribution of trees, shrubs, grasses and forbs in the diet of goats at Zarchi location was 6, 90, 2 and 2% respectively.

As shown in Table 3 below, mean liveweight of does maintained at Tomagh site was 28.3, 23.2, 22.7 and 28.4 kg compared with 25.3, 27.9, 25.4 and 27.4 kg of those grazing on shrubby range of Zarchi, during autumn (LWA), winter (LWW), spring (LWSP) and summer (LWSU) seasons respectively. The liveweight of does during breeding season at Tomagh was 29.2 compared 26.6 kg at Zarchi station.

The conception rate as measured by abdominal palpation after two months of pregnancy, was 88 and 75% in does of Kijli and Kharasani breed maintained at Tomagh and Zarchi stations. The

abortion rate during late gestation was recorded as 8 and 17% in Kijli and Kharasani does, under their respective environments. Kidding percentages were 79 and 58% for Tomagh and Zarchi stations.

TABLE 1. Vegetation of Experimental Sites

Type	Tomagh (Semi-Arid Range)	Zarchi (Arid Range)
Tree	<i>Pistacia khinjuk</i> , <i>Sageratia thea</i> , <i>Olea ferruginea</i>	
Shrub	<i>Ebenus stellatus</i> , <i>Ephedra intermedia</i> , <i>Phalaxis stewartii</i> , <i>Marrubium vulgare</i> , <i>Salvia cabulica</i>	<i>Astragalus stocksii</i> , <i>Convolvulus</i> <i>leocalycinus</i> , <i>Cousinia stocksii</i> , <i>Acantholimon</i> <i>longiflorum</i> <i>Acantholimon</i> <i>munroanum</i> <i>pecularia crispa</i> <i>Caragana ambigua</i> <i>Haloxylon griffithii</i> , <i>Nepeta juncea</i> , <i>Gallonia eriantha</i> <i>Artemisia maritima</i>
Grasses	<i>Pennisetum orientale</i> , <i>Cenchrus ciliaris</i> <i>Cymbopogon jawarancusa</i> <i>Chrysopogon aucheri</i> ,	
Forbs		<i>Lallemantia royleana</i>

TABLE 2: Dry Matter Production (KG/HA) at Experimental Sites.

Major Species	Tomagh (Semi-Arid Range)	Major Species	Zarchi (Arid Range)
	Production		Production
1. <i>Cymbopogon jawarancusa</i>	35.15	1. <i>Artemisia maritima</i>	26.32
2. <i>Chrysopogon aucheri</i>	13.25	2. <i>Haloxylon griffithii</i>	20.84
3. Others	112.50	3. Others	92.32
Total	160.90		139.48

The mean liveweight (LWK) of Kijli and Kharasani does at the time of kidding was 19 and 23.7 kg. The birthweight of kids, regardless the sex born to Kijli and Kharasani does, was measured as 2.6 and 2.1 kg. Does of the Kijli breed, maintained under semi-arid ranges of Tomagh, gained liveweight at the rate of 104 g/day during lactation of 90 days, in contrast to 40 of Kharasani. Liveweight gain if kids suckling to Kijli does was 108 g/day compared with 68 of Kharasani kids under arid environment of Zarchi. The liveweight of kids at weaning was 12.33 and 9.3 kg under semi-arid and arid-environments of Tomagh and Zarchi.

TABLE 3: Seasonal Changes in Liveweight of Does, in Kgs.

Grazing Season	Kijli	Kharasani
Autumn	28.27±2.48	25.30±3.13
Winter	23.17±2.22	27.90±2.85
Spring	22.72±2.80	25.40±2.88
Summer	28.39±2.64	27.40±2.71

The mortality rate, during a lactation period of 90 days was 7 and 18% in kijli and Kharasani breeds. Death losses in Kijli and Kharasani does under their respective environments were zero and six percent. Observations recorded on production traits of economical importance of both breeds under their hometraits of economical importance of both breeds under their hometract conditions are in Table 4.

Data collected on seasonal changes in liveweight, reproductive and productive traits of economical significance was subjected to Randomized Complete Block Design with two ranges as treatment and does as replications.

The climatic characteristics as temperature, rainfall and type of vegetain found at both experimental sites were found in line to those reported by Hasnain (1985) and MART/AZRI). (1987). The species of trees, shrubs grasses and forbs, composing the vegetation, are the same observed by Nasir and Ali, (1974) :

TABLE 4. Production Traits of Does of Economic Importance

Traits	Tomagh (Semi-arid Range)	Zarchi (Arid Range)
Liveweight of does at breeding (kg)	29.21±2.49	26.65±2.31
Liveweight of does at kidding	19.00±2.71	23.70±2.5
Birthweight of kids (kg)	2.58±0.42	2.13±0.43
Liveweight gain of does from kidding till weaning (g/day)	104.28-21.47	40.00±17.05
Liveweight gain of kids from birth till weaning (g/day)	108.34±16.70	68.63±34.0
Final liveweight of kids (kg)	12.33±1.81	9.26±1.79
Milk yield (kg/day)	0.609±94.28	0.39±86.63

Highly significant variations in dry matter production of ranges and subsequent changes in liveweight of does under their respective environments, were due to a number of factors Church (1979) and Malechek and Provenza (1983) suggested that genotypic variations, behavioural traits of animals, morphological and physiological characteristics of plant determined animals feeding strategy used for exploiting the feed resources and subsequent changes in liveweight throughout the year.

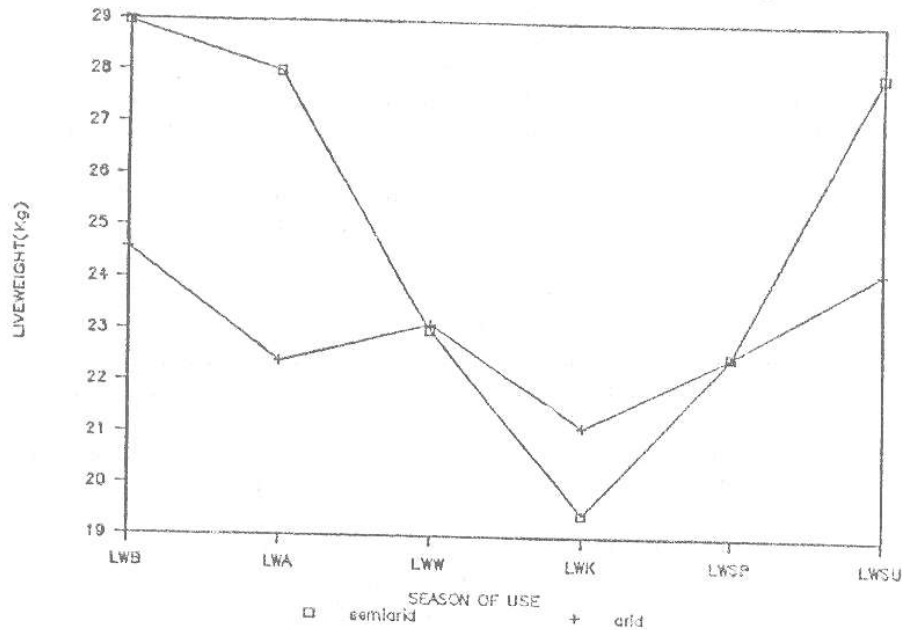
Analysis of variance revealed that liveweight of kijli does grazing on semi-arid range of Tomagh, was significantly greater ($P < .05$) than those of Kharasani does maintained on arid range. This significant difference in liveweight of does in addition to genetic variation in breeds, was also due to quality and quantity of vegetation found on both sites. Under semi-arid environment, appropriate climatic conditions of evenly distributed rainfall and moderate temperature, favoured the growth of plants of trees, shrub and grass species, yielded more dry matter (kr/ha) and ensured continuous supply of nutrients throughout the year hence greater liveweight of kijli does at Tomagh. Poor climatic conditions characterized by highly variable temperature and low rainfall, yielded dry matter of poor quality and of short duration did not help the animals in maintaining their liveweight at Zarchi location.

During winter at semi-arid range of Tomagh, the plant cover was mainly contributed by *Chymbopogon jawarancusa* and *Chrysopogon aucheri*. These species of grasses during winter became dry and herbage production was low, therefore animals had to loose their body weight. The liveweight of Kharasani does grazing on arid range of Zarchi, was significantly greater ($P .01$) than those on semi-arid range of Tomagh. The main reason behind this variation was due to adequate supply of dry matter yielded by *Artemisia martima* and *Haloxylon grifithii*, *Artemisia* sp. flourishes well during winter when most of the precipitation occurs. As a result, dry matter production was adequate and helped the animals in meeting their nutritional requirements.

Liveweight of Kijli does during spring was significantly lesser ($P < .05$) than Kharasani does. This significant difference in liveweight was due to poor supply of dry matter under semi-arid conditions. During early spring plants were at growing stage and due to higher percentage of water, dry matter production was low and could not help the animals in meeting their maintenance requirements, hence losses in liveweight were observed. On the other hand, *Artemisia martima* on arid ranges of southern Baluchistan was depleted due to continuous grazing. However *Haloxylon grifithii* comparatively less palatable, offered adequate grazing potential and yielded more liveweight in does of Kharasani breed ($P < .05$) than Kijli. The liveweight of Kijli and Kharasani does during summer season under their respective environment was similar. Availability of moisture and appropriate temperature during spring had led to optimum growth of both ever green (deciduous plant) as well as grasses, offering greater grazing potential during summer than other season. Deciduous plants *e.g.* *Astrhus* spp. *Convolvulus biocalycinus* sp. *Aconthaltmon* sp. and *Cousinia* sp. found in arid range, were at their optimum production in summer and hence an increase in liveweight of does of both breeds under their respective environment was observed. Seasonal changes in liveweight of does maintained under semi arid and arid environment are shown in Fig. (1).

These observations on dry matter production, seasonal changes in grazing behaviour and subsequent variations in liveweight of does under their respective environment are in line with Griego (1977), Harrington (1978), Church (1979), Vansoest (1982) and Warren *et al.* (1982).

Fig-1 CHANGES IN LIVEWEIGHT OF DOES, Kg



The reproductive performance of Kijli does was found better than Kharasani. This was mainly due to better supply of dry matter during breeding season. A greater liveweight ($P < .05$) of Kijli does during breeding season (LWB) had yielded higher conception rate than Kharasani. This was due to superior genetic make up and better range conditions. In semi-arid environment like Tomagh approximately 40% rainfall occurs in summer having desirable effects on vegetation (MART/AZRI, 1987), than arid ranges where dry matter during summer season is mainly composed of ligno-cellulose with low energy.

The abortion rate during late gestation was greater in Kharasani does than in Kijli. The period of late gestation had coincided to the season when the arid range was at the lowest state of productivity. The available feeding material was mainly composed of ligno-cellulose. The energy generated was utilized in combating the cold climatic conditions. On the other hand nutritional requirements of does, during late gestation had increased. A lower energy intake level than that of corresponding maintenance

needs, during late gestation significantly increased the numbers of abortions under cold climatic conditions. These observations on conception and abortion rates are similar to those reported by Ali *et al.* (1973), Wahid (1973) and Aswad *et al.* (1976)

The liveweight of does at kidding under semi-arid or arid environmental conditions was highly variable ($P < .01$) Kharasani does weighed heavier than Kijli ones. This highly significant variation in liveweight was contributed by adequate supply of dry matter during winter season when maximum rainfall took place at Zarchi. During the winter, shrubs of *Artemisia* spp. had yielded adequate dry matter and helped the animals in increasing their liveweight. In contrast to arid range, vegetation of semi-arid range, remained succulent, yielded low dry matter and subsequently poor liveweight of Kijli does at kidding. The significant variations ($p > .05$) in birth weight of kids were due to in addition to genetic differences among breed, physical and nutritional status of does during late gestation. During late gestation, the nutritional requirements due to developing foetus, had increased. On the other hand, available vegetation due to lack of adequate energy and nitrogen, was unable to meet the maintenance requirements. Under these circumstances; if does do not abort, kids are born with low birth weight. Because of these reasons, birth weight of Kharasani kids was lower than Kijli. These findings on liveweight of does as well as kids at birth, are in line with work done by Kin and Chung. (1979), Mittal (1979) and Mukundan *et al.* (1981).

The liveweight gain (g/day) of both Kijli and Kharasani does during lactation was highly significantly variable ($P < .01$) As shown in table-4, does of Kijli breeds, gained more liveweight than Kharasani. In semi-arid areas kidding usually takes place during late winter to mid spring when vegetation composed of grasses, shrubs and trees, starts sprouting. Although dry matter production was low, yet because of higher nutritive value, Lactating does were able not only in meeting their maintenance and milk requirement but also gaining liveweight. The poor liveweight gain of Kharasani does was due to cold climatic conditions. Low temperature did not allow regrowth of available vegetation. The limited feeds available did not help the does in meeting their nutrients requirements, which led the animals to gain liveweight but at a poor rate.

The rate of liveweight gain (g/day) of kids during lactation and final liveweight (kg) at weaning of 90 days, was highly variable ($P < .01$). Kids of Kijli breed grew faster and gained more liveweight than Kharasani. This was due to higher milk yield ($P < .01$) of their dams grazing on semi-arid range, a mixed shrub grassland with optimum grazing potential during lactation. Higher milk yield of Kijli does led kids to grow faster and gain more weight than Kharasani. Kharasani does had kidded during winter when ranges were less productive. Although *Artemisia* spp. because of rainfall, had offered grazing potential but did not coincide to the requirements of lactating does. Milk yield was poor and did not help the kids in gaining liveweight comparable with Kijli. Liveweight gain of kids during lactation and liveweight at weaning of 90 days are close to those reported by Montsma *et al.*, (1981) and Kirkpatrick and Akindele (1974).

The mortality rate from birth to weaning, was greater ($P < .01$) in kids of Kharasani than in Kijli breed. Higher mortality had been attributed to poor birthweight of kids, low milk yield of does and severe cold and are in line with those observed by Mittal (1976), Khan *et al.*, (1978) and Matthewman (1977).

The highly significant differences ($P < .01$) in milk yield of both breeds during a period of 90 days, have been due to productivity of their respective ranges. Eight to twelve weeks of kidding is the period of peak lactation. This peak lactation period coincided to the season when ranges of semi-arid environment, were flushy and offered more grazing potential to lactating does which led to increased milk yield. Under arid environment, low temperature did not allow the grassy and shrubby species of vegetation to sprout and regrow, hence low grazing potential was available for lactating animals, leading to low milk yield and liveweight gain of does as well as kids of Kharasani breed. The daily milk yield of both breeds under their respective environments are in agreement to those measured by Barkat and Chowdhry (1978).

R e c o m m e n d a t i o n s

Keeping the biological and economical role, present and future production potential concerning these species on the ranges of Baluchistan, it is recommended that :

1. Depleted ranges should be provided immediate protection from the grazing for a couple of years to restore the climax potential of the area.
2. The range should be properly stocked and a suitable grazing system like "deferred-rotational grazing" should be followed to obtain forage on sustained basis.
3. During lean periods of the year which coincides to the physiological states of late gestation and early lactation, animals should be provided supplementation. Dry forages should be introduced to overcome the shortage of this malnutrition during winter. This will help in improving the fertility rate and controlling the abortions during winter season.
4. Trees and shrubs having higher nutritive value than grasses and suitable to the local climatic conditions should be planted.
5. Range management activities so far have been limited at government levels. These activities should also be shared by farmers and fieldmen.

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ملاحظات على السمات التناسلية والإنتاجية للماعز في مروج منطقة - بالوخستان - باكستان

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تم تسجيل الخصائص التناسلية والإنتاجية لنوعى Kharasani, Kijli من الماعز قرباء مروج جافه وشبه جافه في منطقة بالوخستان Baluchistan بالباكستان . وكان نوعى الاعشاب الساندين في المحتوى النباتي للمروج شبه الجافه هما *Chrysopogon aucherii*, *Cymbopogon jwarancusa* وكان معدل الغطاء النباتي ٣٥ - ٤٠ ٪ تقريبا

اما مروج المناطق الجافه في بلوفاستان الغربية فيسودها شجيرات في معظمها *Artemisia maritima*, *Holoxylon griffii* كان معدل الحمل للاناث ٧٩٤٨٨ ٪ ومعدل التوالد ٥٨٤٧٥ ٪ من نوعى Kharasani, Kijli على التوالي . كان التباين معنويا ($P < .05$) في وزن الامهات والجديان عند الوضع . كانت الزيادة في وزن الامهات خلال الحليب ١.٤ ، ٤.٠ مم / يوم للنوعين على التوالي بتباين معنوي ($P < .01$) . وكانت زيادة الوزن الجديان ١.٨ ، ٦.٨ مم / يوم للنوعين ($P < .01$) . وكان الاختلاف في وزن الفطام معنويا ($P < .05$) بين النوعين . في حين وكان الاختلاف بين النوعين في انتاج اللبن فكان واضح المعنوية ($P < .01$) وقد تم مناقشة الانتاجية في المروج واثر ذلك على الوزن الحي في الموسم المختلفه - كما تم مناقشة وسائل تحسين المروج .