International Scholars Journals

African Journal of Tropical Agriculture ISSN 2375-091X Vol. 4 (7), pp. 001-005, July, 2016. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Pure breeds and crossed caprine genotypes effect in the oases of southern Tunisia

Amor Gaddour* and Sghaier Najari

Arid Land Institute, 4119 Medenine, Tunisia.

Accepted 09 January, 2016

Data from 16 years performances schedule of local goat, Alpine, Damascus, Murciana and crossed groups were used to study the genotypes productive behaviour under Tunisian oases conditions. The aim was to evaluate the possibilities of local goat productivity improvement by cross-breeding in intensive mode and also, to choose the better improving breed and the propice crossing level. So, data of periodic individual weighing were used to estimates kids weight at some standard ages and dairy performances such as, daily milk average, total production by lactation and milking period of studied genetic goat groups. Statistical analyses of about 1928 kids' weights and 1923 individual goat milking showed that the cross-breeding allowed to improve the growth performances since the first generation with respect to local population production. ANOVA test showed an important effect of genotypes and environment upon kids weights (P < 0.01). The mean kid's weight at birth and at 120 days age were 3.49 and 15.78 kg respectively. The cross breeding second generation allowed the improvement of local goat potentialities kids weight at 120 days reaches 16.19 kg for Damascus*local goat cross. The dairy production with this generation was 164.5 kg for the Alpine one, 183.4 kg for Damascus, 179.5 kg for Murciana and 133.5 kg by lactation for the local breed. All imported breeds registered low performances than those known in their original regions.

Key words: Cross breeding, dairy production, Kids growth, local goat, Oases, Tunisia.

INTRODUCTION

The *Capra hircus* is considered being the older domesticated, among livestock species (French, 1971). Its husbandry goes up to more than 10,000 years before Jesus Christ (Fabre-nys, 2000). During its long breeding period, goat has varied its breeds and products to justify its actual large distribution in the major parts of environments and production systems in the world (Alexandre et al., 1997).

In Tunisia, the national caprine herd is estimated at approximately 1,300,000 reproductive females and more than 60% of the national herd is raised on the rangelands of the country arid area (DGPA, 2005; Najari et al., 2006). Since centuries, local goat population valorizes the arid pastures scarce resources under the harsh climate of arid zone. The lactated kids' meat is the main product for this breeding mode and contributes about 75% of the regional meat production (Najari et al., 2007).

The Tunisian local goat population shows a large morphological and productive variability with a particular adaptation capacity to difficult natural conditions (Najari et al., 2006). In the Tunisian arid region, local goat is essentially raised in pastoral and agropastoral modes and is often considered able to reproduce during all the years, as well as for other caprine rustic populations (Chemineau et al., 1991; Alexandre et al., 1997; Delgadillo et al., 1997).

Under oasian conditions, the goat husbandry plays a capital role by its significant various contributions in the farmers' incomes (D'Aquino, 1995; Jamali and Villemeot, 1996). Goat benefits from an intensified breeding mode under weak climatic risks which characterize the arid area (Morand-Fehr and Doreau, 2001). Contrary to pas-toral mode, the main goat oasian production is the milk.

Regardless to the production objective, goat productivity success remains largely monitored by reproductive performances and kids survival. Is well known that the heat peaks and climatic stress, affect reproduction, both of the male and the female, for caprine as well as for all the

*Corresponding author. E-mail: amor.gaddour@ira.agrinet.tn, gaddour.omar@yahoo.fr. Tel: +21675633005. Fax: +21675633006.

mammalies species (Williams and Helliwell, 1993). Amongst other things, the environmental stress decrease the oestrus duration the fecundation rates and increase foetal mortality (Le Gal and Planchenault, 1993).

The confirmed local goat low productivity in pastoral system can be attributed to natural and technical resources scarcity (Caruolo, 1974; Pasquini et al., 1994). The extensive breeding mode can be considered as a factor reducing goat productivity. Sometimes, the local goat population genetic capacities shows a serious restriction to improve goat production specially for milk knowing that local goat is traditionally raised to produce kids meat (Najari et al., 2007).

To improve caprine productivity and to optimize oases resources valorisation, a crossing plan of the local goat was adopted as the solution to resolve this genetic problem. Thus, a crossing project to substitute local goat by more productive caprine crossed genotypes was realised by the Institute of the Arid Areas (Médenine Tunisia). To meet this goal, some goat breeds (Alpine, Damascus and Murciana) were imported and the crossing program was applied in the Chenchou experimental station.

Based on a large data base issued from 16 years animal survey of pure breeds and crossed genotypes performances, several studies evaluated genotypes productivities (Najari et al., 1996; Najari, 2003; Hatmi et al., 1998; Gaddour, 2005).

Despite of dairy production importance in oases, the kids' meat production contributes in the family incomes each flow. Considering this caprine meat importance for regional demand satisfaction, improving slaughtered kids weight represent one of major direct crossing scheme objective. Thus, the study focuses on kid growth potential of pure and crossed genotypes used in this project. The aim is to evaluate the improvement possibilities by local goat cross breeding and also, to choice the propice imported breed and the cross level to allow better valorisation of oases intensive resources.

MATERIAL AND METHODS

Study area

The crossing project was carried at the Institute of the Arid Areas of Medenine at the station of Chenchou (Southern of Tunisia). The station is located in the lower arid bioclimatic stage; with mean annual rainfall of 188 mm. January is the coldest month of the year, with temperature average of 10,7°C, while August is the hottest month with a mean temperature of 27,3°C (Ouled Belgacem, 2006).

Animal material

Local goat

The local goat population is characterised by its small size with a height of 76 cm for the male and 60 cm for the female (Ouni, 2006; Najari et al., 2007). Characteristics of the population include the ability to walk log distances, water deprivation resistance and good kidding ability. The native goat is hairy, basically black coat-colored with spots on the head, horned and have bread and dewlap on the neck. Fertility rate is about 87% and prolificacy rate varies between 110 and 130% (Najari et al., 2006). Kidding season begins in October and continues till February with a concentration in November and December when 69.2% of kids are born.

Ameliorative breeds

To cross local goat, three ameliorative breeds were used. Thus, Alpine, Damascus and Murciana breeds were imported respectively from France, Cyprus and Spain since 1980.

Crossing scheme

To produce the first crossed generation, local goats are mated with bucks of ameliorative breeds. For later crossing stage, at each generation, the crossed females are mated with bucks of imported breeds as indicated in Figure 1. So, the crossing scheme allows a progressive increase of the ameliorative percentage genes pool, during successive generations (Gaddour et al., 2006a). Theorically, the crossing plan will be considered as achieved with reaching crossed genotypes performances similar to those of the ameliorative breeds.

Data base

During 16 years, the crossing scheme was applied and an individual periodical weighing control was continuously realized since the birth and till the kids weaning in summer beginning. So, about 1928 annual kids' data files are registered and used as the data base for this study. For each kid the data include: kids and mother identification, birth data, sex, birth mode, genotype and control dates with respective observed weights. The data set was verified and individual kid’s weight at standard ages was estimated by extra or intra population (Gaddour et al., 2006a; Ouni, 2006). The considered standard ages are birth, 10, 30, 70, 90 and 120 days.

The collected data correspond to the years of controls since 1980, a total of: 1923 cards of lactation of the goats gathering for each goat, dairy control data. This considerable quantity of informa-tion was elaborated in order to estimate the following performances: dairy performances are for each goat: total milk production, average daily milk production and milking period.

The SNK mean comparison test (= 5%) was applied to identify homogeneous statistical groups for each variable and variation factors. Statistical analysis was done by SPSS program (SPSS, 1998).

RESULTS AND DISCUSSION

Kids growth performances means comparison by genotype

To study the genotype effect and discriminate homogenous groups with respect to studied variables, a means comparison test SNK (= 5%) was applied. The means comparison result was regrouped in Table 1.

At birth, the kids of the Alpine and the Damascus breeds have a body weight in average of 3.6 and 3.66 kg respectively. The local population kids weight was only 2.92 kg at birth in average. These values seem to be higher than elaborated by Ben Hammouda et al. (1991).

Females local goat X Bucks from ameliorative breeds

G1 Males kid's (slaughtered) Crossed Females X Bucks from ameliorative breeds

G2 Bucks from ameliorative breeds X Crossed Females Males kid's (slaughtered)

G3 Males kid's (slaughtered) Crossed Females X Bucks from ameliorative breeds

Gn ……

Figure 1. Local goat cross breeding diagram.

Table 1. Kids weights (kg) means and homogenous groups (SNK test =5%) by studied genotypes.

Genetic groups	N	PN	P10	P30	P70	P90	P120
Alpine (A)	767	3.6^{a}	5.41^{a}	8.11^{ab}	10.81^{ab}	13.13^{abc}	14.80^{ab}
Damascus (D)	169	3.66^{a}	5.49^{a}	8.16^{ab}	11.3^{bc}	14.51^{ab}	16.48^{a}
Murciana (M)	148	2.38^{j}	3.91^{b}	6.35^{d}	8.24^{f}	11.07^{d}	11.98^{c}
Local (Lo)	148	2.92^{def}	4.48^{b}	6.68^{cd}	9.12^{ef}	11.88^{cd}	12.85^{c}
A1	137	3.08^{cde}	5.87^{a}	8.14^{ab}	10.76^{bcd}	13.77^{abc}	15.03^{ab}
A2	176	3.37^{abc}	5.22^{a}	8.56^{ab}	12.21^{ab}	14.13^{ab}	15.78^{a}
A3	15	3.31^{bcd}	5.39^{a}	8.96^{a}	12.88^{a}	14.94^{a}	16.37^{a}
D1	49	3.55^{ab}	5.88^{a}	7.79^{abc}	13.13^{bc}	15.74^{ab}	16.42^{abc}
D2	28	3.44^{abc}	5.69^{a}	8.27^{ab}	11.71^{bc}	14.59^{ab}	16.19^{a}
D3	18	2.94^{cde}	5^{a}	7.07^{bcd}	10.1^{cde}	12.07^{bc}	13.56^{abc}
M1	15	2.61^{fj}	4.02^{b}	6.46^{d}	9.22^{ef}	11.75^{cd}	14.42^{abc}
M2	17	2.72^{ef}	4.29^{b}	7.21^{bcd}	9.24^{def}	11.99^{cd}	13.9^{abc}
General	1687	3.21	5.05	7.64	10.72	13.29	14.81

N: observations; A1, A2 and A3: crossed Alpine*local; D1, D2 and D3: crossed Damascus*local; M1 and M2: crossed Murciana * local;
$^{a, b, c, d, e, f}$ and ^{j}: homogenous groups;
PN, 10, 30, 70, 90 and120: kids weight at birth, 10, 30, 70, 90 and 120 days.

The Murciana kids recorded the weakest weights at the birth.

Figure 2 resume the kids' weights separately for pure breeds and crossed genotypes. Among the crossed genotypes, the SNK test (= 5%) shows that the heaviest group is composed by the crosses: A2 (A X Lo), A3 (A X Lo), D1 (D X Lo) and D2 (D X Lo) with respective weights at the birth of 3.37, 3.31, 3.55 and 3.44 kg. The crosses D3 (D X Lo), M1 (M X Lo) and M2 (M X Lo) have2.94, 2.61 and 2.72 kg as weights at the some age respectively (Figure 2).

Kids weight at birth remain an important productive index due to it relation with meat production and also, with the kids survival probability (Husain et al., 1995; Awemu et al., 1999; Anastazios and Ezzat, 2002). After birth and at later standard ages, among the pure breed, the Damascus and the Alpine kids, had the heaviest weights for all the considered ages. For example, we registered a 5.49 and 5.41kg as kids weight at 10 days age respectively for Damascus and Alpine. At 120 days age, the Damascus kids still the heaviest with a weight of 16.48 kg. The local population and the Murciana breed recorded the weakest weights with 12.85 and 11.98 kg respectively at 120 days (Figure 2).

Among the crossed genotypes, with respect to the kids weights after birth, the SNK test (= 5%) differentiated two groups relatively homogenous, the first group corresponding to the highest weights contains A2 (A X Lo), A3 (A X Lo), D1 (D X Lo) and D2 (D X Lo) genotypes. For example, the kids of D1 (D X Lo) genotype weight about 3.55 kg at birth.

At the third crossing generation, the crossed (A X Lo)

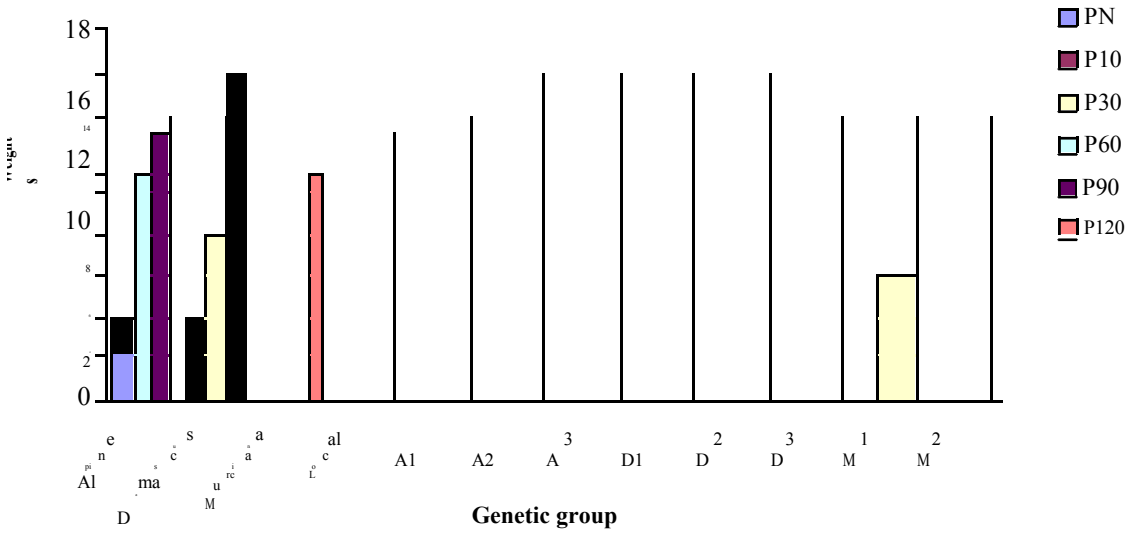

Figure 2. Kids weights at standard age for pure and crossed genotypes.

Table 2. Total milk production, average daily milk production, milking period and SNK test for dairy performances of local goat Alpine, Damascus, Murciana and crossed genotypes.

Genetic groups	Factors	Total milk production (kg)	Average daily milk production (kg/days)	Milking period (days)
Alpine (A)	213	244.44^{a}	1.85^{a}	132.12^{b}
Damascus (D)	51	177.05^{ab}	1.22^{a}	145.12^{b}
Murciana (M)	46	187.75^{ab}	1.20^{b}	156.45^{ab}
Local (Lo)	10	133.53^{b}	0.76^{c}	175.69^{a}
A1	25	164.53^{ab}	1.17^{b}	140.62^{b}
A2	14	226.21^{a}	1.53^{b}	147.84^{b}
D1	14	183.41^{ab}	1.17^{b}	156.76^{ab}
D2	19	180.18^{ab}	1.17^{b}	154^{ab}
M1	7	179.37^{ab}	1.12^{b}	160.15^{ab}
M2	13	160.82^{ab}	1.28^{b}	125.64^{b}

(A1, A2: crossed Alpine X Local; D1, D2: crossed Damascus X Local and M1, M2: crossed Murciana X Local, a, b and c: Homogeneous groups).

kids had the highest weight at 30 days age (8.96 kg). The weight gain explained by the superiority of their mothers on the level of the dairy performances compared to the others crosses (Gaddour, 2005; Gaddour et al., 2006a). The weight of the Damascus crossed kids at 120 days in the first generation is about 16.5 kg (Figure 2).

Dairy performances means comparison by genotype

The performances of dairy production of the various studied genetic groups and the SNK test (= 5%) are presented in Table 2. Among the pure breeds (Table 2), the Alpine goat presents the best performances of mean dairy with a total production of 244.44 kg during a period of more than 132 days and with a daily mean production of 1.85 kg/days, followed by Damascus with a total production of 177.05 kg during 145.12 days. The Alpine breed is known with its high dairy performances (Najari, 2005).

The Murciana breed registered the weaker performances since its total production is about 187.75 kg. Also, Murciana breed is characterized by its long period of lactation with 156.45 days. The local goat has the weakest performances, with a total production of 133.53 kg during approximately 175.69 days. These results seem to be largely higher than those mentioned in the final report of PNUD project (1991) and the analyses achieved on a more reduced data base by Ben Hammouda et al. (1991).

Compared with their dairy performances in their relative original cradles, all ameliorative breeds register low than the half of their milk production under Tunisian oasian conditions and adaptative capacities remains necessary

to realize high milk production (Najari, 2005).

Concerning the crossing genotypes, the crossed Alpine confirm the superiority of their performances as compared to the other groups. Also, their dairy productions increase with the degree of substitution through crossbreeding. Indeed, the production by lactation of A1 (A X Lo) and A2 (A X Lo) were 164.53 and 226.21 kg respectively with reference to the same results (Table 2). So, a heterosis effect not appears in this study for dairy characters, the performances of the crossed genotypes are all lower than those of the paternal pure breeds.

Conclusion

The comparison of the pure races and the genetic groups cross shows that, the performances of the local goat remains weak whereas the ameliorative races knew a decrease of their production compared to that known in their country of origin. The Alpine race was distinguished both as pure and as crossed by the best performances in dairy production and growth of the kids. However, the comparison of performances of production remains insufficient to conclude about the bio economic interest of the choice from the ameliorative race. Indeed, other parameters of production like the reproduction and mortality need to be included to reach more valid conclusions on the level of the development of the goat breeding in the littoral oases. The important difference between the studied genotypes appears visible by studying the performances of the reproduction and of mortality. This could be explained by the interaction between genotypes and the environment.

REFERENCES

Alexandre G, Aumont G, Despois P, Mainaud JC, Coppry O, Xandé A (1997). Productive performances of guadeloupean Creole goats during the suckling period. Small Rumin. Res. 34: 157-162.

Anastazios N, Ezzat ST (2002). Goats Husbandry for Extensive Use. Technical paper. Witzenhausen 14p.

Awemu EM, Nwakalor BY, Abubakar Y (1999). Environmental influences on pre-weaning mortality and reproductive performance of Red Sokoto does. Small Rumin. Res. 34 : 161-165.

Ben Hammouda M, Djemali M, Dahmane T (1991). Analyse des données relatives au croisement d'absorption de la chèvre locale à l'Institut des Régions Arides (Medenine) 24p.

Caruolo EV (1974). Milk yield, composition, and somatic cells as a function of time of day in goats, Br. Vet. J. 130: 380-387.

Chemineau P, Mahieu M, Varo H, Shitalou E, Jego Y, Grude A, Thimonier J (1991). Reproduction des caprins et des ovins Créoles de Guadeloupe et de Martinique. Rev. Elev. Méd. Vét. Pays Trop. N° spécial pp.45-50.

D'Aquino P, Lhoste P, Le Masson A (1995). Interactions entre les systèmes de production d'élevage et l'environnement. Systèmes de production mixtes agriculture pluviale et élevage en zones humides et sub-humides d'Afrique. Rapport du CIRAD-EMVT. France 103p.

Delgadillo JA, Malpaux B, Chemineau P (1997). La reproduction des caprins dans les zones tropicales et subtropicales. INRA Prod. Anim. 10: 33-41.

DGPA (2005). Statistiques de la direction de la production et du développement Agricole. Ministère de l'agriculture 45p.

Fabre-nys C (2000). Le comportement sexuel des caprins hormonal et facteurs sociaux, INRA Prod. Anim. 13 : 11-23.

French MH (1971). Observation sur la chèvre, Organisation des Nation Unies pour L'alimentation et L'Agriculture Rome 227p.

Gaddour A (2005). Performances de croissance et de production laitière des groupes génétiques caprins issus d'un croisement d'absorption de la chèvre locale dans les oasis du sud tunisien, Mastère en Génétique et Bioressources 73p.

Gaddour A, Ouni M, Abdennebi M, Najari S, Khorchani T (2006a). Amélioration des performances caprines dans les oasis par le croisement d'absorption de la chèvre locale. Revue des Régions Arides (accepté).

Hussain SS, Horst P, Islam ABMM (1995). Effect of different factors on pre-weaning survivability of Black Bengal kids. Small Rumin. Res. 18: 1-5.

Hatmi H, Attia H, Najari S, Khorchani T (1998). Caractérisation des laits de différents génotypes caprins : qualité et aptitude aux traitements technologiques. 6ieme Int. Symposium on the milking of small Ruminants. Athène, GRECE EAAP Publication Sept. 26- Oct. 1, pp. 528-530.

Jamali M, Villemeot M (1996). L'expérience Tunisienne en matière de filière lait caprin : le projet d'intensification de l'élevage caprin laitier dans les oasis tunisiens, PICO / OEP-UCARDEC. FAO 256p.

Morand-Fehr P, Doreau M (2001). Ingestion et digestion chez les ruminants soumis à un stress de chaleur. Productions Animales (INRA). Prod. Anim. 14: 15-27.

Najari S (2003). Goat production in the southern Tunisia. IGA newsletter, in P. Morand-Fehr pp 14 -16.

Najari S (2005). Caractérisation zootechnique et génétique d'une population caprine. Cas de la population caprine locale des régions arides tunisiennes, Thèse de doctorat d'Etat 214p.

Najari S, Gaddour A, Abdennebi M, Ben HM, Khaldi G (2006). Caractérisation morphologique de la population caprine locale des régions arides tunisiennes, Revue des Régions arides. 17 : 23-41.

Najari S, Gaddour A, Ben H, Djemali MM, Khaldi G (2007). Growth model adjustment of local goat population under pastoral conditions in tunisian arid zone. J. Agron. 6 (1): 61-67.

Ouled BA (2006). Statut écologique, performance biologique et aptitude de la réinstallation de stipa lagascae R et SCH dans les écosystèmes dégradés des milieuxarides tunisiens. Thèse doctorat, Faculté des Sciences de Sfax 147p.

Ouni M (2006). Caractérisation morphométrique des ressources génétiques caprines des régions arides tunisiennes, Mastère en Génétique et Bio ressources 78p.

Pasquini LU, Ballou RD, Bremel RD, Greppi GF (1994). Detection of protyletic degradation of milk protein and relationship with different levels of SCC in Italian goats, Prod. Int. Symp. Somatic cell counts and mik of small ruminants, 25-27 Sept., Bella. Italy.

PNUD et FAO (1991). Projet PNUD/FAO/TUN/84/013/A/01/12 : Amélioration et développement des productions animales dans le centre sud tunisien. Rapport technique 35p.

SPSS (1998). SPSS Manual, Version 8.0. SPSS Inc., Chicago, IL.

Vernon, R.G., 1986. The growth and metabolism of adipocytes. In: Buttery, P.J., Haynes, N.B., Lindsay, D.B., (Eds), Control and Manupulation of Animal Growth. Butter worths, London pp. 67-83.

Williams LM, Helliwell RJA (1993). Melatonin and seasonality in the sheep. Anim. Reprod. Sci. 33: 152-159.