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Productive performance of pure breeds and cross-bred goat genotypes in southern Tunisia

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SUMMARY – The study aim was to establish meat and dairy performance of local goats, some breeds and cross-bred groups under an oasis management mode in southern Tunisian. A large data set, collected from 1980 to 1996, was used to analyse the phenotypic potential of the genotypes. Periodic individual controls were used to estimate kids-goat weight at some standard ages and dairy performance such as, daily milk average, total production by lactation and milking period of the goat's genetic groups under study. Statistical analyses of about 1928 kids-goat weights and 1923 individual goat milking showed that cross-breeding allowed growth performance to be improved from the first generation compared to the production of the local population. The Alpine*local goat cross showed the greatest potential. Kid weight increased on average about 125% at 120 days of age. The performance of all imported genotypes seems to be lower than those known in their original areas.

Key words: Cross-breeding, kids growth, dairy performances, local goats, Tunisian oasis.

RESUME – *"Performances productives des génotypes caprins de race pure et croisés dans le sud de la Tunisie". L'étude vise à établir la croissance des chevreaux et la production laitière de la chèvre locale, pour certaines races caprines importées dans les oasis du sud tunisien. L'ensemble de données, recueillies de 1980 à 1996, a été utilisé pour analyser les potentialités des groupes génétiques. Les contrôles individuels ont été utilisés pour estimer le poids des chevreaux à un âge standard et les produits laitiers tels que la production totale, la moyenne journalière de lait et la durée de lactation. Les analyses statistiques d'environ 1928 fiches de croissance de chevreaux et 1923 fiches de lactation de chèvres en lactation ont montré que le métissage a permis l'amélioration des performances de croissance depuis la première génération. Le gain de poids a augmenté en moyenne d'environ 125% à 120 jours d'âge. Les performances de tous les génotypes importés semblent largement inférieurs à ceux connus dans leurs zones d'origine.*

Mots-clés : *Croisement, croissance des chevreaux, performances laitières, chèvre locale, oasis tunisiennes.*

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 (Pasquini *et al.,* 1994). 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 (Najari *et al.,* 2006). Since centuries, local goat population valorises 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).

Under oasian intensive management, local goat showed reduced dairy performances with respect to the breeding conditions. Thus, a crossbreeding program was applied to produce caprine genotypes having better dairy potentialities. Three breeds: Alpine, Damascus and Murciana were imported and used as paternal breed in the crossing scheme (Najari *et al*., 2006).

Materials and methods

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 kids 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. More ever, the collected and elaborated data regroups 1123 lactation data. This considerable quantity of information was elaborated in order to estimate the following dairy performances are for each goat: total milk production, average daily milk production and milking period by the Fleishmann method. The SNK mean comparison test (α = 5%) was applied to identify homogeneous statistical groups for each variable and variation factors. Statistical analysis was made using SPSS program.

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 (α = 5%) was applied.

At birth, the kids of the Alpine and the Damascus breeds had, on average a body weight of 3.60 kg and 3.66 kg respectively. The local population kids weight was only 2.92 kg at birth on average. These values seem to be higher than the elaborated by Ben Hammouda *et al.* (1991). The Murciana kids recorded the weakest weights at the birth. Fig. 1 resumes the kids weights separately for pure breeds and crossed genotypes.

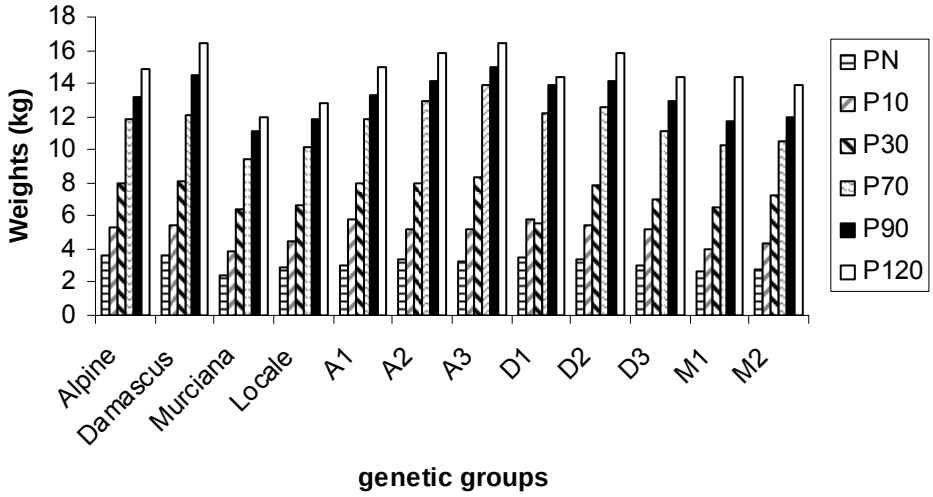

Fig. 1. Pure breeds and crossed kids weights (kg) estimated at birth, 10, 30, 60, 90, and 120 days of age.

Among the crossed genotypes, the SNK test (α=5%) shows that the heaviest group was 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) had 2.94, 2.61, and 2.72 kg as weights at the same age respectively (Fig. 1).

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 5.41 kg as kids weight at 10 days age respectively for Damascus and Alpine. At 120 days age, the Damascus kids were 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 (Fig. 1).

Among the crossed genotypes, with respect to the kids weights after birth, the SNK test (α = 5%) differentiated two groups relatively homogenous, the first group corresponding to the highest weights contained 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 weighted about 3.55 kg at birth.

Dairy performances means comparison by genotype

The performances of dairy production of the various studied genetic groups and the SNK test (α = 5%) are presented in Table 1.

Table 1. 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.

Among the pure breeds, the Alpine goat presented the best mean dairy performances with a total production of 244.44 kg during a period of more than 132 days and a mean production of 1.85 kg, followed by Damascus with a total production of 177.05 kg during about 145 days. The Alpine breed is known by its high dairy performances (Najari, 2005).

The Murciana breed registered the weaker performances since its total production was about 187.75 kg. Also, Murciana breed is characterized by its long period of lactation with 156.45 days. The local goat had the weakest performances, with a total production of 133.53 kg during approximately 175 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 ameliorated breeds registered lower than half of their milk production under Tunisian oasis conditions and adaptative capacities remain necessary to realize high milk production (Najari, 2005).

Concerning the crossing genotypes, the crossed Alpine confirmed the superiority of their performances as compared to the other groups. Also, their dairy productions increased 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 kg and 226.21 kg respectively with reference to the same results (Table 1). So, a heterosis effect did appear in this study for dairy characters. The performances of the crossed genotypes were all lower than those of the paternal pure breeds.

Conclusions

The comparison of the pure races and the genetic groups crosses showed that the performances of the local goat remained weak whereas the ameliorated races showed a decrease in their production as 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 remained insufficient to conclude about the bio economic interest of the choice of the ameliorated 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 o mortality. This could be explained by the interaction between genotypes and the environment.

References

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

D'Aquino, P., Lhoste, P. and 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. 103 p.

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

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, 73 pp.

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

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, 214 pp.

Najari, S., Gaddour, A., Abdennebi, M., Ben Hamouda, M. and 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 Hamouda, M., Djemali, M. and Khaldi, G. (2007). Growth model adjustment of local goat population under pastoral conditions in tunisian arid zone. *Journal of Agronomy,* 6 (1): 61-67.

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

Pasquini, L.U., Ballou, R.D., Bremel, R.D. and Greppi, G.F. (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 September 1994, Bella. Italy.