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Selecting feed-efficient sheep with concentrates alters their efficiency with forages and behaviour.

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Selecting to improve feed efficiency is an objective shared by all animal productions, with the aim of reducing feed consumption and rejects while maintaining production abilities. To make such a selection, the Residual Feed Intake (RFI) is the most convenient trait. We divergently selected Romane meat sheep on their RFI under a 100% concentrate diet. In the 3rd and 4th generations of selection, a total of 332 Romane males, belonging either to the RFI- (efficient) or RFI+ (inefficient) lines with a difference of 2 genetic standard deviations between lines, were phenotyped. Feed efficiency and feeding behaviour traits were recorded during 2 phases: a first phase under a 100% concentrate diet from 3 to 5 months of age and then a second phase under a mixed diet (forage *ad libitum* + 700 g of concentrate) from 6 to 8 months of age. The significant difference in RFI between lines under a concentrate diet (131 g/d) was still significant under the mixed diet although reduced (51 g/d), with RFI- being more efficient than RFI+. In terms of feed intake (FI), the RFI+ males ingested more feed than the RFI- ones whatever the diet: +123 g/d of concentrate during the first phase and +80 g/d of forage with no difference in restricted concentrate during the second phase. Between the 2 diets, correlations were of +0.27 for RFI and +0.22 for FI. During the concentrate diet phase, RFI- males had a lower daily duration of intake and fewer daily visits to the feeders. During the mixed diet phase, there was only a trend toward fewer daily visits (P=6%) at forage feeder for RFI- sheep, no difference in restricted concentrate intake behaviour, but a significantly slower water drinking rate for the efficient animals. Analysis of feeding times per hour highlighted that efficient animals ate more often after peak feeder times, about one hour later. Could efficient sheep be dominated while accessing feeders?