



## Essential oil bearing supplementation of dairy cows - *in vivo* experiments elucidating factors and co-factors influencing parameters of feed efficiency

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The aim of this research was to elucidate effects of supplementation of essential oils (EO) on parameters of feed efficiency (FE) in dairy cows. An *in vivo* experiment involved 16 early lactating Simmental cows in 2 groups and a provided mixture of EO. The EO group of cows (n = 8) received a total mixed ration (TMR) plus 6 kg of a concentrate containing 3g EO mixture per day. The untreated group (CON) received the same TMR and concentrate but without EO. The experiment lasted from day 15 to 56 postpartum, whereby the days 15 to 28 were used for diet adaptation. Results showed significantly higher dry matter intake (DMI) of TMR for CON cows (22.48 vs. 21.03 kg for treated), while intake of the concentrate did not differ statistically. Daily milk yield was significantly higher for CON than for treated cows (39.17 vs. 37.10 kg). FE (milk yield /DMI) exhibited no influencing by treatment. TMR FE development during the experiment displayed a strong negative correlation of FE trend line slope and intercept ( $r = -0.887$ ,  $p = 0.003$ ) in the treated group with a very high quadratic coefficient of determination ( $R^2 = 0.922$ ). An inherent FE of 1.75 seems to separate the predicted benefit of FE for treated cows vs. untreated ones. Cows with a higher inherent FE will rather benefit from EO feeding in the early lactation period. By including body weight (BW) and pre-experimental TMR FE as co-variables ( $p = 0.001$  and  $0.403$ , resp.), significant treatment influence ( $p = 0.001$ ) appeared with a higher FE for treated cows (1.84 vs. 1.80 for CON). A meta-analysis of 10 previous studies with 18 *in vivo* experiments of dairy cows fed with EO revealed a low positive correlation ( $r = 0.15$  to  $0.34$ ,  $p < 0.001$  to  $0.002$ ) between BW and the variables change in DMI, 4% FCM and FE FCM due to treatment. BW groups (<600, 600-649, 650-699, >700 kg) showed significant influence on the change of DMI, FCM and FE ( $p$  always  $< 0.001$ ), whereby group 2 (600-649 kg) showed the strongest mean increase of FE (plus 0.18) compared with CON group. No evidence of a general enhancement of FE after EO intake in dairy cows could be determined, unless additional pre-existing parameters were considered. A focus on specific EO compounds, mode of action and a consideration of numerous *in vivo* influencing co-factors is recommended to increase predictability of success.