Annual pastures, seed mixtures and supplementary feeding in organic milk production

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Grazing is an essential part of organic dairy farming. During growing season cattle must have an access to pasture and when possible the feeding should be based on grazing (EU 1804/1999, CEC 1999). Consequently farmers are interested in new practices and pasture species supporting efficient grazing management. The current study was aiming to evaluate annual legume-grass-cereal mixture as a basal feed for dairy cows under organic or other low fertiliser input systems in Nordic conditions. An additional aim was to evaluate the effect of concentrate feeding regimen in order to simplify grazing management.

Eight lactating Finnish Ayrshire cows were used. The design was 4 x 4 Latin square with two replicates and four 21-day feeding periods including a 14-day adjustment period and a 7-day recording period. Four experimental treatments in a 2 x 2 factorial arrangement consisted of two sward mixtures and two concentrate feeding regimens. Clover mixture (CM) contained 12 and 2 kg ha^{-1} Persian clover (*Trifolium resupinatum* L.) and white clover (*Trifolium repens* L.), respectively. Vetch mixture (VM) contained 20 and 14 kg ha^{-1} common vetch (*Vicia sativa* L.) and hairy vetch (*Vicia villosa* Roth.), respectively. Both mixtures contained also 80 and 14 kg ha^{-1} barley (*Hordeum vulgare* L.) and Italian ryegrass (*Lolium multiforum* Lam.), respectively. Concentrate was offered either once (4 kg) or twice (2 + 2 kg) daily. Herbage allowance (HA) was 21.5 kg DM (above 3 cm) cow^{-1} day^{-1}. Paddocks of three to four days were used. The size of paddocks was determined by herbage mass basis to meet the HA demand.

Milk production differed neither between cows grazing CM and VM nor between cows supplemented once and twice per day (ns = non significant, $P>0.05$, Table). Barley predominated early in the summer but it was rapidly replaced by other species, while legumes dominated increasingly in late summer. Despite of major changes in botanical composition, herbage chemical content was relatively constant during entire grazing season. VM had lower ($P<0.01$) mean *in vitro* organic matter digestibility than CM (0.742 *vs.* 0.778), but similar ($P>0.05$) crude protein (223 *vs.* 212 g kg^{-1} DM) and neutral detergent fibre (401 *vs.* 381 g kg^{-1} DM) content. During the last feeding period cows grazing CM had temporary bloat problems, indicating too high clover proportion (0.675).

Table. The effect of pasture and supplementation on milk production

Sward mixture	Clover mixture		Vetch mixture		Significance	
Concentrate feeding	Twice	Once	Twice	Once	Sward	Feeding
Milk yield kg day^{-1}	21.8	22.0	22.0	20.6	ns	ns
Fat yield g day^{-1}	892	892	907	859	ns	ns
Protein yield g day^{-1}	733	735	739	682	ns	ns

The present study demonstrated that both annual clover and vetch pasture to have potential in organic farming. Sward mixture had no effect on milk production suggesting similar total nutrient intake in CM and VM. HA of 21.5 kg DM seemed to be near optimal for both. Concentrate feeding regimen had no effect on milk production indicating that moderate level of concentrate supplement can be offered once per day to simplify feeding. When grazing legume rich sward the risk of bloat should be recognised.