A comparison of the efficacy of an ultra-low volume applicator for liquid-applied silage inoculants with that of a conventional applicator

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Introduction Liquid-applied silage inoculants are normally sprayed onto forages cut for ensiling at application rates from 1 to 3 l/t. Applicator tanks can require frequent re-filling, especially with large self-propelled forage harvesters having harvest rates in excess of 1000 t/d. This can be an issue for fields remote from the farm, for areas with restricted water availability and for contractors paid by the area harvested. This study was conducted to assess the efficacy of inoculant distribution on the crop using a simple, ultra-low volume (ULV) applicator compared with a conventional liquid-applied silage inoculant applicator.

Materials and methods A series of 10 experiments was conducted in the UK and Germany. Forage crops were harvested using self-propelled forage harvesters and forage samples were collected either untreated or treated with 'Ecosyl' silage inoculant, formulated to apply 10^6 cfu/g forage, using an 'Ecosyler' ULV applicator at 10, 15 or 20 ml/t or a 'Magnum' conventional applicator at 1500 ml/t. The 'Ecosyler' applicator comprises a small tank, a peristaltic pump and an electronic speed control box. It relies on the air speed (41-68 m/s) at the exit from the harvester accelerator fan, where the inoculant was applied, to atomise the inoculant suspension. Both applicators were calibrated prior to use. Twenty samples of each of the untreated or treated forages were taken for microbial counts to assess the homogeneity of distribution of the inoculant lactic acid bacteria (LAB) applied to the treated forages.

Results Mean LAB counts on the untreated and treated forages in each of the 10 experiments are shown in Table 1, together with the coefficients of variation (CV%) for each set of counts to express homogeneity of distribution of inoculant LAB with the different applicators.

Table 1 Distribution of LAB on forages

Experiment	Crop	ULV rate (ml/t)	Mean LAB count log 10 cfu/g, (CV%)		
			Untreated	Magnum	Ecosyler
1	Grass	10	3.60 (17.6)	5.82 (5.1)	5.83 (4.4)
2	Grass	10	3.96 (4.5)	5.89 (2.9)	5.76 (2.8)
3	Grass	10	3.95 (3.5)	5.87 (2.6)	5.94 (2.6)
4	Grass	10	4.60 (4.0)	5.96 (1.7)	5.84 (3.9)
5	Grass	20	5.11 (3.4)	6.18 (2.2)	6.35 (3.5)
6	Triticale	15	4.95 (2.0)	5.91 (2.6)	6.03 (2.3)
7	Wheat	15	4.90 (2.7)	5.70 (1.4)	6.00 (2.0)
8	Wheat	15	4.92 (1.8)	5.43 (3.3)	6.17 (3.4)
9	Wheat	15	5.92 (4.8)	6.46 (1.5)	6.32 (1.6)
10	Maize	15	4.56 (2.4)	5.83 (3.0)	6.00 (1.8)

The CV% for the counts from the 'Magnum' and 'Ecosyler' ranged from 1.4 to 5.1 (mean 2.8) and 1.6 to 4.4 (mean 2.6), respectively. Analysis of variance showed no statistically significant difference between the mean CV% for the 2 applicators (P=0.53, SEM 0.15) nor between the mean LAB counts achieved (Magnum 5.91, Ecosyler 6.02, P=0.20, SEM 0.042).

Conclusions The distribution of the inoculant LAB on the treated forage crops was similar for both the ULV applicator at 10-20 ml/t and the conventional applicator at 1500 ml/t. The air speeds of the forage harvesters used were sufficient to atomise the ULV-applied inoculant to give effective crop coverage at low liquid application rates. The variation in LAB application numbers achieved with both applicators is believed to be a result of the inherent inaccuracy of harvest rate estimates used to set applicator flow-rates.