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SURVIVAL OF PATHOGENIC AND SPOILAGE MICROORGANISMS IN SILAGE AT TWO DIFFERENT DRY MATTER CONTENTS

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INTRODUCTION

Recirculation of plant nutrients is desirable from a sustainability point of view, but cannot be accepted at the cost of introducing infectious matter into the food chain. Urban waste-generated organic residues can provide for a part of the plant nutrients needed in agricultural production. In organic farming, ley is an important crop and it would be valuable to use these areas for amendment of organic residues. Today, however, amendment of organic residues on ley is not recommended due to possible hygienic risks involved. Zoonoses may spread in the food chain and there may also be a risk of spreading spoilage organisms, such as *Clostridium tyrobutyricum*. More knowledge is needed to accurately assess these risks. In Sweden, the use of silage with high dry matter content has increased, partly due to the risk of botulism, as Clostridia are more sensitive to low water activity compared to lactic acid bacteria. Crops with high dry matter, however, are difficult to pack and there is therefore a higher risk of aerobe zones and thereby slow and incomplete fermentation. As an additional factor, yeasts and moulds can grow at a lower water activity, compared to bacteria. The main objective of the present study was to evaluate the survival of pathogenic and spoilage microorganisms in silage with low and high dry matter content, respectively.

MATERIALS AND METHODS

Mineral-fertilised grass swards were harvested as first cut and chopped to 20 mm nominal length. The crop was wilted for approximately 24 h (low dry matter content) and 48 h (high dry matter content), respectively. The herbage was seeded and carefully mixed with a suspension containing *Clostridium tyrobutyricum, Salmonella Typhimurium, Listeria monocytogenes, Campylobacter jejuni, Escherichia coli*, and two thermo-tolerant moulds (*Talaromyces emersonii* and *Byssochlamus nivea*). The treated herbage was then packed in 0.75 litre plastic silos and stored at 22°C. Directly after seeding, the herbage was analysed for the presence of microorganisms and at 7, 60 and 100 days of incubation. Standard culture dependent methods were used, and for pathogens only presence or absence were determined.

RESULTS AND CONCLUSIONS

All of the pathogens, except *Campylobacter*, survived an incubation period of 7 days. The pH was higher (1 unit) in the high dry matter herbage, while the concentration of short-

chained fatty acids was lower, indicating a non-successful ensiling process. Nonetheless, no pathogens survived after 60 days, regardless of treatment. However, *Clostridium tyrobutyricum* and *Byssochlamus nivea* survived in high numbers in all silos, even after a period of 100 days. There is no evidence in the current study that higher dry matter content could cause a higher hygienic risk if the herbage is sufficiently packed. Further studies with different grades of packing are needed to elucidate the dependence of packing on the survival of pathogenic microorganisms.