Resilience of machair soil to amendment with kelp and synthetic fertiliser

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Crofting on the machair, traditionally a low-intensity agricultural system, is practised on calcareous sandy soils with low organic carbon. Cultivation includes shallow ploughing, using kelp (seaweed) as a fertiliser and soil conditioner (Angus, 2001). During the previous decade, deeper ploughing and partial substitution of kelp by inorganic nitrogen, phosphorous and potassium (NPK) fertiliser has occurred in response to socio-economic pressures on machair crofts. The effects of these agronomic changes on the machair are not known. A field experiment was conducted on a cropped field with bere barley (*Hordeum vulgare*) at Drimsdale, South Uist in the summer 2006, to study how these changes may affect soil stability, microbial biomass and activity on the machair. Experimental treatments were ploughing and no ploughing, and amendments with NPK fertiliser, kelp or in combination. Soil samples were taken four times through the growing season from May to September.

The field experiment revealed a decoupling between organic soil amendments and response in microbial and soil physical measures. Some significant differences between fertiliser treatments occurred for most of the properties studied, but these were small compared with the differences between sampling times. Furthermore, the observed fertiliser treatment effects were not consistent between sampling times, but generally fertilisers decreased aggregation, soil water retention, microbial biomass and activity relative to the unamended control. Of the properties measured, only soil water retention and abundance of saprotrophic fungi were in a few cases significantly affected by ploughing.

That fertiliser amendments did not shift the values of the measured properties outside the ranges found during the season for the control indicates resilience of the machair soil. The lack of response to organic fertiliser is surprising, and in contradiction to findings by Haslam and Hopkins (1996), who found an increase in pore volume, aggregate stability, microbial activity and biomass following addition of kelp to a sandy soil in amounts similar to those used in the present study. We propose that the machair soil does not respond to fertiliser in a growing season because the soil is at an equilibrium characterised by low aggregate stability and an average level of microbial activity and biomass.

REFERENCES

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