Replacing Pollution With Symbiosis: Nitrogen Fixating Sainfoin and Its Applicability in a Danish Agricultural Transition

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The danish oceans, fjords and lakes are oxygen deficient due to excessive rain washing fertilizer and pesticides into them. This results in a critical reduction of the biodiversity in these marine ecosystems. The farming of legumes with an active nitrogen fixating symbiosis (NFS) is a possible approach to reducing fertilizer usage. Specifically Onobrychis viciifolia Scop., otherwise known as sainfoin, has the potential to benefit danish agriculture due to its potential for human consumption. Despite this, very little research has been made into sainfoins nitrogen fixation. This project aims to fill the academic gap by researching the relation between soil properties, access to compatible rhizobia species and efficiency for sainfoins NFS. A two-part research design is used to best account for lacking literature. First an inductive experiment gathers data to supplement the existing literature in the creation of a hypothesis. Then a deductive experiment is conducted over five steps : a soil sample analysis, an open pot experiment, an acetylene reduction assay that measures the efficiency of the symbiosis, 16s genetic sequencing that identifies the bacteria and then a closed pot experiment to verify the repeatability of the symbiosis. So far only the open pot experiment has been conducted and it shows signs of an active symbiosis in a swiss soil sample. This is notable since very few rhizobia species have been identified as compatible with sainfoin. Therefore, future research will focus on identifying the species and its compatibility with microbiomes and properties in danish field soil.

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