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Review

The value of biodiversity in legume symbiotic nitrogen fixation and nodulation for biofuel and food production

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ABSTRACT

Much of modern agriculture is based on immense populations of genetically identical or near-identical varieties, called cultivars. However, advancement of knowledge, and thus experimental utility, is found through biodiversity, whether naturally-found or induced by the experimenter. Globally we are confronted by ever-growing food and energy challenges. Here we demonstrate how such biodiversity from the food legume crop soybean (*Glycine max* L. Merr) and the bioenergy legume tree *Pongamia* (*Millettia*) *pinnata* is a great value. Legume plants are diverse and are represented by over 18,000 species on this planet. Some, such as soybean, pea and medics are used as food and animal feed crops. Others serve as ornamental (*e.g.*, wisteria), timber (*e.g.*, acacia/wattle) or biofuel (*e.g.*, *Pongamia pinnata*) resources. Most legumes develop root organs (nodules) after microsymbiont induction that serve as their habitat for biological nitrogen fixation. Through this, nitrogen fertiliser demand is reduced by the efficient symbiosis between soil *Rhizobium*-type bacteria and the appropriate legume partner. Mechanistic research into the genetics, biochemistry and physiology of legumes is thus strategically essential for future global agriculture. Here we demonstrate how molecular plant science analysis of the genetics of an established food crop (soybean) and an emerging biofuel *P. pinnata* feedstock contributes to their utility by sustainable production aided by symbiotic nitrogen fixation.

Contents

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