

FINAL REPORT

CSP00191

Nitrogen inputs by Free living (FL) nitrogen fixing bacteria - Grower messages

PROJECT DETAILS

PROJECT CODE: CSP00191

PROJECT TITLE: NITROGEN INPUTS BY FREE LIVING (FL) NITROGEN FIXING BACTERIA - GROWER MESSAGES

START DATE: 01.07.2014

END DATE: 30.06.2015

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Summary

Biological nitrogen (N) fixation is highly desirable for the economic and environmental sustainability of nutrient limited agricultural systems in Australia. This project developed extension messages that were communicated in articles in industry magazines and contributions to the Soil Biology Initiative (SBI) II technical report. These messages were based on the findings from the project 'CSP00138 Manipulating biological processes that improve nitrogen supply to cereal crops: Free Living (FL) nitrogen fixing bacteria' and GRDC SBI II theme-based projects. These identify areas that are likely to produce agronomically significant amounts of N inputs. They are designed to help growers and agronomists incorporate contribution from free living N fixation in their N management decisions.

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Old or Archival Reports (Projects that concluded in 2007 or earlier)

The information contained in these older reports is now several years old, and may have been wholly or partially superseded or built upon in subsequent work funded by GRDC or others. Readers should be aware that more recent research may be more useful for their needs. Findings related to agricultural chemical use are also potentially out of date and are not to be taken as a recommendation for their use.

Conclusions

The main objective of this one year project was to harvest key messages from the projects funded through the GRDC Soil Biology Initiative II including the project CSP00138 'Manipulating biological processes that improve nitrogen supply to cereal crops: Free Living (FL) nitrogen fixing bacteria'. This was achieved in multiple meetings where researchers in collaboration with agronomists and farming system specialists developed extension messages from the new scientific findings. These were used in disseminating the information to growers and agronomists. The project provided an opportunity to bring the new knowledge to the attention of growers to facilitate quick and successful adoption. These activities improved the knowledge and ability of growers to make a change in their management practices to maximise the contribution from free living N fixation in grain cropping systems.

Recommendations

Growers are keen to find ways to improve biological health of soil that increases N inputs in grain cropping systems to reduce fertiliser costs and to improve soil's ability to supply N when needed by the plant. There is a need for future research to develop management strategies that maximise freeliving N fixation and assist with synchronisation of N release to meet crop demand. Research to explore whether there are plant types and varieties that support efficient freeliving N fixing bacterial communities could also be beneficial.

Outcomes

Nitrogen (N) availability to plants is the product of a variety of biological processes including free living N fixation, which are variably influenced by environmental and management factors. Currently growers and agronomists do not consider free living N fixation contribution in assessing N requirements of crop or designing N application strategies. This is mostly due to lack of information about what regulates free living N fixation and the amount of N inputs in cropping systems.

Through a variety of communication activities, extension messages were developed based on recent research findings and delivered to growers to help improve their knowledge and ability to make a change in their management practices to maximise the contribution from free living N fixation in regional grain cropping systems. Successful adoption of management practices that maximise N inputs from free living N fixation would help reduce fertiliser costs and improve the economic and environmental sustainability of cropping systems.

Achievements/Benefits

Participated in the GRDC SBI-II organised meetings:

Soil Biology Theme 3 meeting held at Stamford Grand Sydney Airport on November 18, 2014

Meeting for 'Developing extension messages arising from GRDC SBI-II' held during February 26-27th 2015 at AgriBio, Melbourne

Organised teleconference meetings to discuss extension messages from Theme 3 and Theme 2 meetings during March 2015. Contributed to the development of material for SBI-II harvest year talks delivered by Pauline Mele, Soil Biology Theme co-ordinator.

Industry talks at end user meetings and articles:

Gupta, V.V.S.R., Kroker, S.K., Hicks, M., Davoren, C.W. and Llewellyn, R. (2015). Summer active perennial grasses influence biological functions in Mallee soils in South Australia MSF 2014 Compendium articles, MSF Inc., Mildura. http://msfp.org.au/wp-content/uploads/2015/02/Vadakattu_Perennial-grasses.pdf

Gupta, V.V.S.R. (2015). Biological processes involved in C and N cycling in cropping soils. Aust Soil Science Riverina branch member group visit to the Karoonda field site during July 2014.

Gupta, V.V.S.R. (2014). Bacteria's N role measured. Ground Cover supplement - GRDC Soil Biology Symposium.

Talks given at scientific meetings:

Gupta, V.V.S.R., Penton, C.R. and Tiedje, J.T. (2015). Edaphic and plant associated factors drive diazotroph diversity and function in Australian soils. BAGECO 13th Symposium on Bacterial genetics and biology - The Microbial continuity across changing ecosystems, Milan, Italy, pp 147-148.

http://www.bageco2015.org/fileadmin/media/2015/bageco/Bageco2015_HPr_web.pdf

Gupta, V.V.S.R. 2014. Non-symbiotic N₂-fixation in Australian Cropping soils. Invited talk given at Soil Science Australia SA branch meeting on 'N in Agriculture' held on April 13 at University of SA, Adelaide.

Penton, C.R., Gupta, V.V.S.R., Hicks, M., Bell, M., Murphy, D., Neate, S., Smith, C.J., Tiedje, J.M. and Kroker, S. (2014). Diversity of nifH-harbouring bacteria and non-symbiotic N₂ fixation in Australian cropping soils. Grand Challenges Great Solutions, ASA, CSSA & SSSA International Annual Meeting, Nov 2-5 in Long Beach, CA.

Gupta, V.V.S.R., Penton, C.R., Kroker, S., Hicks, S., Bell, M., Neate, S.M., Murphy, D., Smith, C. and Tiedje, J.M. (2014). Diversity of nifH-harbouring bacteria and non-symbiotic N₂ fixation in Australian cropping soils. In: The 17th Australian Nitrogen Fixation proceedings, Gupta V.V.S.R., Unkovich, M. and Kaiser, B. N. (eds.), Australian Society for Nitrogen Fixation, Adelaide, pp. 40-41.