# Grower Summary

## FV 428a

Vining peas: The effect of soil phosphate levels on rhizobial populations

Final 2017

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| **Project title:** | Vining peas: The effect of soil phosphate levels on rhizobial populations |
| **Project number:** | FV 428 |
| **Project leader:** | Dr Lea Herold, PGRO |
| **Report:** | Final report |
| **Previous reports:** | Annual reports January 2015 and January 2016 |
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| **Date project commenced:** | 03/02/2014 |
| **Date project completed (or expected completion date):** | 28/02/2017 |

# GROWER SUMMARY

## Headline

The application of starter fertilisers to peas at drilling did not consistently improve yields. Fertiliser applications did not impact on rhizobial populations in soil.

## Background

Pea yields have reached a plateau in many areas over recent years and one option to try and boost yields is the application of starter fertilisers. Legume crops have the ability to fix nitrogen in nodules which are formed on their roots by colonisation of rhizobia. Starter fertilisers contain phosphorus which is important for root development, nodule formation and nitrogen fixation by rhizobia. Nitrogen fixation not only delivers nitrogen to the pea crop but also increases soil nitrogen contents for subsequent crops. Some starter fertilisers, however, contain nitrogen which can be damaging to nodule formation with negative impacts on the pea crop and soil nitrogen contents. Thus, it is important to maintain soil conditions that sustain healthy rhizobial populations in soil. The project therefore investigated whether applications of starter fertilisers increased pea yields and whether they had an effect on rhizobial populations in soil.

## Summary

Field experiments were established over three growing seasons in 2014, 2015 and 2016. In each year, three field experiments were carried out in an early, mid and late drilled pea crop. Each experiment consisted of seven treatments – an untreated control, application of Primary P (a starter fertiliser that contains 40% P and 10% N) or Microstar (a starter fertiliser that contains 45% P but does not contain N) at three rates of 7.5 kg/ha, 10 kg/ha (commercially recommended rate) and 12.5 kg/ha. Each plot was approximately two hectares in size and was treated, other than the application of starter fertiliser, as the surrounding commercial crop. The effects of fertiliser application on shoot mass at first pod and on yield were measured. Shoot mass was measured of 20 randomly selected pea plants. Unreplicated yield data was gathered in the first two years and four sub-plots per treatment in the 2016 season. The application of starter fertiliser did not influence shoot mass in any of the seasons (Figures I, II and III) and yields were not affected (Figure IV). Yield data for each individual plot are listed in Appendix 1.

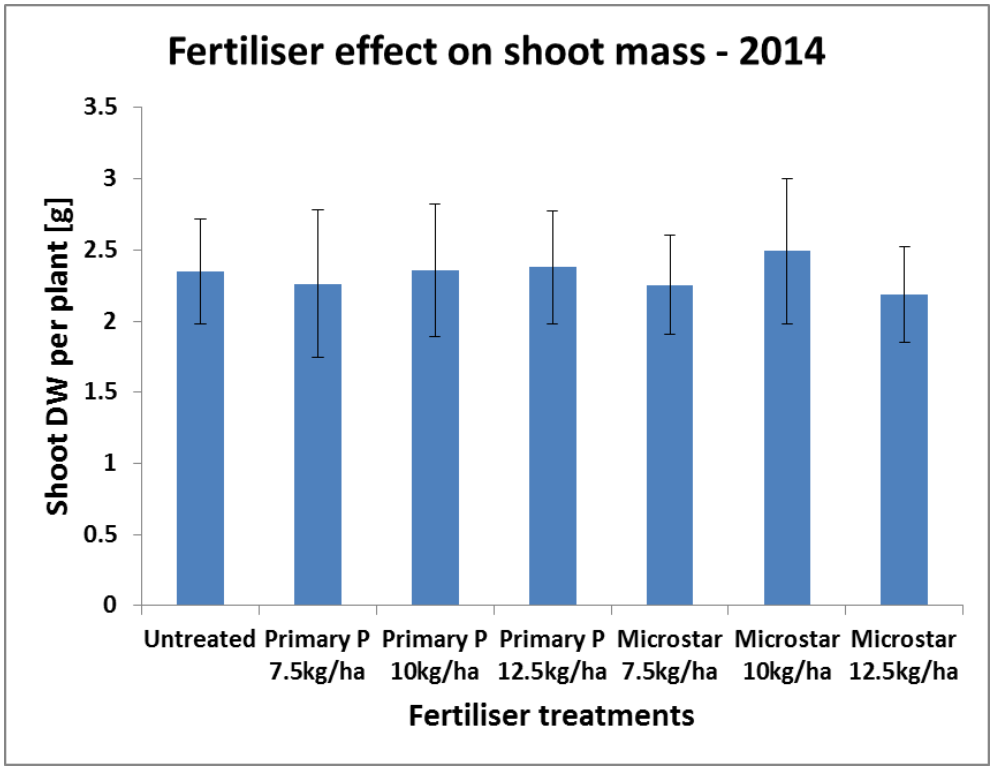


**Figure I.** Shoot mass of plants collected from the different field trials in 2014. Field plots had been drilled early, mid or late during the season. Mean values (n = 12) and standard error.

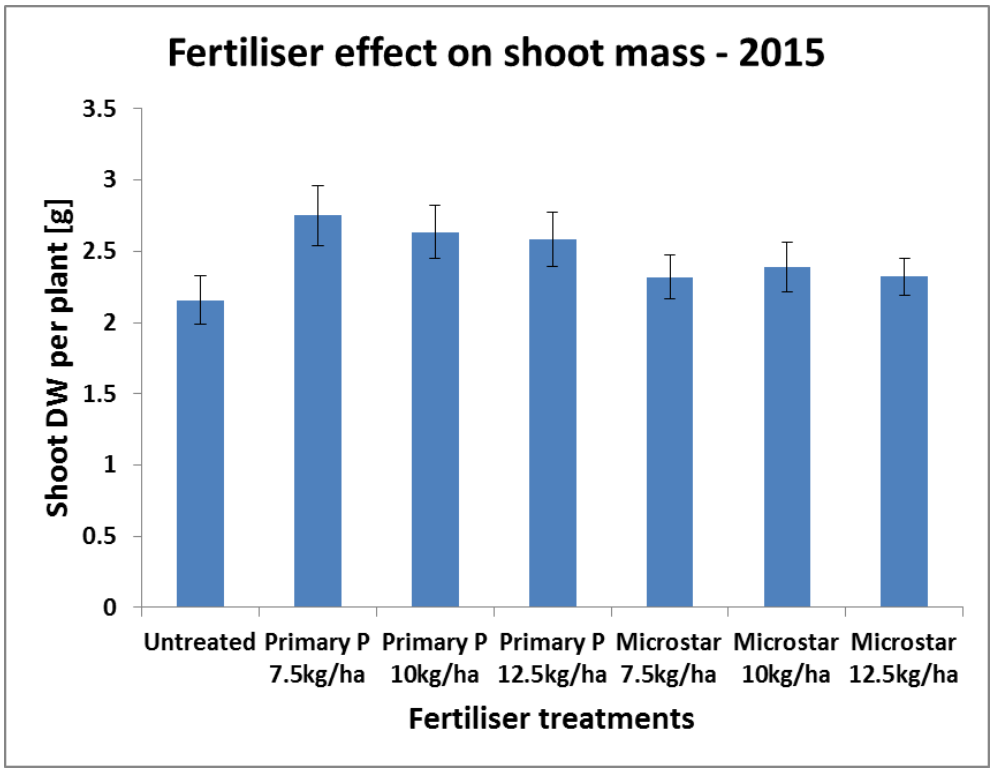


**Figure II.** Shoot mass of plants collected from the different field trials in 2015. Field plots had been drilled early, mid or late during the season. Mean values (n = 12) and standard error.

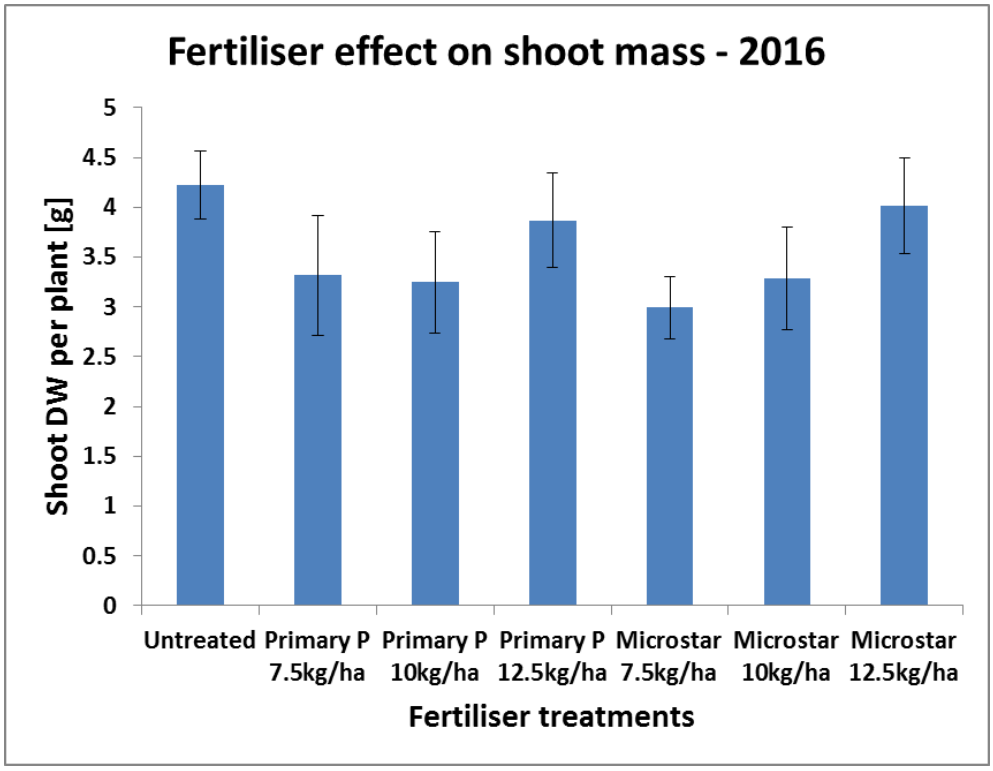


**Figure III.** Shoot mass of plants collected from the different field trials in 2016. Field plots had been drilled early, mid or late during the season. Mean values (n = 12) and standard error.

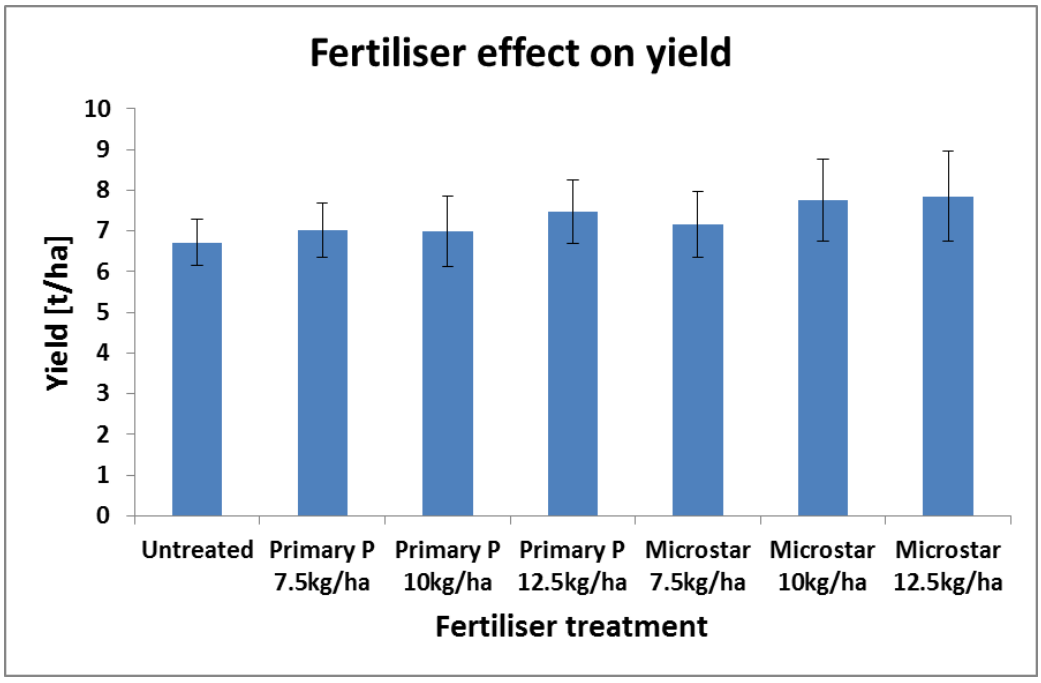


**Figure IV.** Yields recorded from plots that had received different fertiliser treatments. Field plots had been established in 2014, 2015 and 2016, and had been drilled early, mid or late during each season. Mean values (n = 14) and standard error.

Healthy rhizobial populations are of importance in pea crops because nodulation delivers nitrogen to the crop. Application of nitrogen fertilisers can reduce nodulation and the project

investigated whether low amounts of nitrogen applied to the pea crop would negatively impact rhizobial populations in soils. In order to investigate the size of rhizobial populations in soils their potential to form nodules on pea roots was investigated in a glasshouse experiment. Pea seedlings were inoculated with soils collected from the field experiments and after four weeks the number of nodules formed on the pea roots was counted. The higher the number of nodules per plant the larger is the rhizobial community in the soil which has the potential to colonise pea plants in the field. None of the fertiliser treatments had any effect on rhizobial populations demonstrating that low amounts of nitrogen applied to pea crops is not damaging to rhizobia (Figure V).

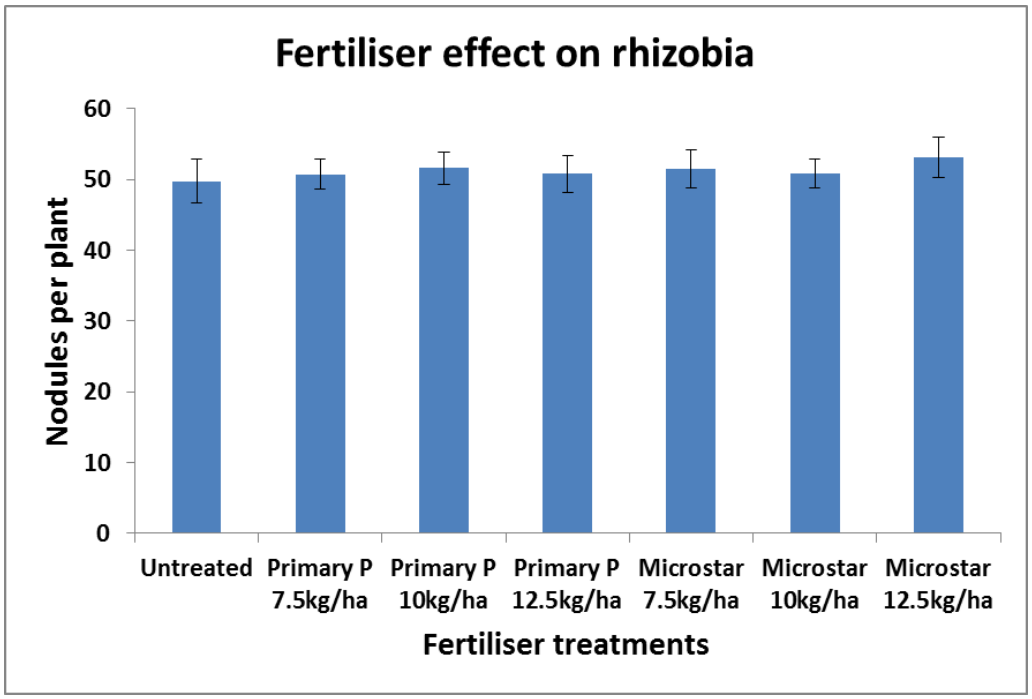


**Figure V.** Nodules per plant representing rhizobial population sizes at first pod. Fields plots had been established in 2014, 2015 and 2016. Field plots had been drilled early, mid or late during the season. Mean values (n = 108) and standard error.

## Financial Benefits

Overall, no reliable yield improvements were seen due to fertiliser application. However, starter fertilisers are not very costly at approximately £25/ha. The average price for vining peas is around £345/t and a pea yield increase of greater than 73 kg/ha will therefore result in an economic benefit for pea growers.

## Action Points

The project has shown that the application of starter fertilisers with low amounts of nitrogen does not reduce rhizobial populations in soils. The application of starter fertilisers does therefore not seem to be disadvantageous to pea crops. Although yields were not consistently

improved by the application of starter fertilisers a benefit might be seen in situations when plant establishment and initial growth are slow.