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BREEDING FOR WHEAT-PEA MIXTURES: ARE THE TRAITS OF PEA VARIETIES IN SOLE CROP PREDICTIVE OF THEIR BEHAVIOR IN MIXTURE?

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In France, the production of grain legumes has declined significantly over the past 20 years. Two of the main technical issues in pea cropping are the instability of yields, linked to the effects of abiotic and biotic stresses, and the high lodging rate at harvesting. An alternative to overcome these limiting factors is to grow peas in mixture with a cereal to better control canopy lodging, diseases and pests, and generate additional income. This is a widespread practice in Organic Farming.

One emerging issue is whether the choice of the pea cultivar that would be best suited to be mixed with the cereal should be based on identified varietal traits, already assessed in sole crop. We therefore explored to what extent the traits and performances evaluated in sole crop are predictive of those observed in mixtures? We compared pea varieties in sole crop and in mixture with bread winter wheat, for traits likely to ensure the success of the mixture, including phenology (such as beginning and end of flowering dates), morphology (such as pea height in the canopy at the beginning, at the end of flowering, and at the end of the cycle), and finally productivity (such as thousand grains weight and grain yield). Six trials were carried out in Organic Farming (*) or very low input (**) systems during the 2015/2016 to 2018/2019 seasons, in the Parisian Basin (Orsonville**), the north-west (Rennes*) and the center (Civray**) of France. Five to nine winter pea cultivars with contrasting phenological, morphological and productivity traits were sown as sole crop and mixed (at 75% of the sole crop doses) on the row with a single bread winter wheat cultivar.

In our environmental conditions:

- The dates of beginning and end of flowering, and the thousand grain weights of pea cultivars were very similar in mixture and in sole crop. The values of these traits in sole crop therefore seem to be predictive of those in mixture.
- All pea varieties were higher in mixture than in sole crop, whatever the developmental stage, confirming the ongoing tutor effect of wheat on pea.
- The pea variety heights at the start and end of flowering in sole crop seem to be predictive of those observed in mixture.
- Both for pea varieties height at the end of the cycle and for pea varieties grain yield, the values in sole crop did not seem to be predictive of those observed in mixture. Consequently, the development of specific breeding schemes and ratings for the evaluation of these traits in mixture appears necessary.

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