To: The Editors of New Phytologist

Re: Submission of the manuscript, “Local to continent-scale variation in fitness and heritability in common bean (*Phaseolus vulgaris*)”.

Dear Editors,

We are pleased to submit this manuscript for consideration to *New Phytologist*. We believe it will support the journal’s tradition of publishing papers of relevance to scientists interested in understanding the roles of selection and genetic variation in shaping thefitness of plant populations across changing conditions. We quantified the impact of domestication and recent selection histories on the local adaptation and heritability of *Phaseolus vulgaris* L. (common bean). *P. vulgaris* is a unique model system for studying these processes: It was independently domesticated multiple times from different genepools; one of the domestication events resulted in an unusual increase in genetic diversity; and modern selection has occurred at both continental and regional scales simultaneously. We used data from the Cooperative Dry Bean Nursery (CDBN), a continental-scale multiple environment trial with 35 years of phenotypic data for over 300 genotyped entries.

**Questions**

1. How has recent selection history impacted yield heritability in two genepools of *P. vulgaris*?
2. How has selection for both broad and regional adaptation affected environmental specialization?

**Advances**

We characterize adaptability using complimentary metrics: the recently-derived “home field advantage”, which quantifies site specialization of individual entries, and population-level heritability. These metrics were dynamic across locations and time, sensitive to major gene introgressions, and spatially independent. They revealed nuanced, actionable insights into the potential of plant populations to maintain fitness in changing conditions.

**Timeliness**

The interplay between specialization and genetic variation provides insight into urgently important evolutionary processes. Natural populations are experiencing unprecedented selection pressures and loss of genetic diversity; adapting to new conditions will be critical to their survival. Likewise, domesticated populations may be selected for local specialization to maintain oft-precarious local food security.

We anticipate that this paper will further build *New Phytologist*’sunparalleled credibility by highlighting how local adaptation and spatial differences in heritability impact the maintenance of plant populations. Given the challenges facing both natural and domestic populations, the outcomes of these processes will determine the maintenance of biodiversity and food security in an increasingly uncertain world. On behalf of my co-authors, thank you for your consideration. We look forward to working with you.

With kind regards,

Dr. Patrick Ewing

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