Weed Risk Assessments Can Be Useful, But Have Limitations

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Gordon et al. (2016) claim that our study (Smith et al. 2015) “misrepresents the utility of WRA tools” and outline four key issues. We affirm that our study was conducted in accordance with Weed Risk Assessment (WRA) guidelines (Koop et al. 2012; Pheloung et al. 1999) and is equally robust as or more robust than other evaluations of bioenergy crop invasiveness using WRAs; moreover, we detail cherry-picked quotes and misrepresentation of our conclusions by Gordon et al. (2016).

First, Gordon et al. (2016) criticize our application of WRAs at the species level. To start, all other WRA assessments of bioenergy crops have been done at the species level (even for species that have clear subspecific taxa), including several by our critics (Buddenhagen et al. 2009; Davis et al. 2010; Gordon et al. 2011). In rare circumstances WRAs have been run for clear and unambiguous existing [e.g., fertile vs. sterile Miscanthus × giganteus M. Greef & Deuter ex Hodkinson & Renvoize (giant miscanthus)] or hypothetical [e.g., sterile switchgrass, Panicum virgatum (L.)] sub-specific taxa (Barney and DiTomaso 2008; Barney et al. 2015). In particular, Gordon et al. (2016) criticize our decision to combine data for crop sorghum and its invasive variety, shattercane—both Sorghum bicolor (L.) Moench. However, we already discuss the consequences of this decision, and our rationale for making it, in our paper (Smith et al. 2015; see also Barney et al. 2015). Gordon et al. (2016) also ignore the example in which we evaluated the two major “cultivars” of M. × giganteus, which get very different WRA outcomes (Smith et al. 2015), as well as sorghum and shattercane (Barney et al. 2015). Ironically, in describing the challenge of running the WRA for S. bicolor, Gordon et al. (2011) state that “the taxa whose traits are described are not always clearly identified in the literature.” As we state (Smith et al. 2015), subtle differences in traits among sub-specific taxa are unlikely to be well captured with current WRAs, or, more likely, there exists too little information for specific subspecies to conduct a WRA, or, as Gordon et al. (2011) found, the literature does not make clear distinctions among subspecific taxa. In other words, evaluating WRAs at the cultivar level is often impossible and rarely done. Because the vast majority of WRAs are instead assessed at the species level—for example, there are >100 named cultivars of Miscanthus sinensis Andersss. (eulaliagrass), but all WRAs have been run at the species level (Croisi et al. 2010; Gordon et al. 2008; Nishida et al. 2009)—it was crucial that our study also be conducted at the species level. As we discuss (Smith et al. 2015), we agree that when sufficient information exists, WRAs can be conducted at the subspecies level (e.g., Barney et al. 2015), but argue this becomes especially complicated in the case of crops (agronomic or horticultural) with their myriad cultivars and domesticated traits. Despite running the WRAs using the same criteria as our critics (e.g., Buddenhagen et al. 2009; Gordon et al. 2011), Gordon et al. (2016) claim we are afoul of standards.

Second, Gordon et al. (2016), stating that “not all agronomic weeds become invasive,” claim that we do not clearly define invasive and argue that this has influenced our results. Gordon et al. (2016) do not outline how or where in the WRAs the distinction of the term “weed” would contrast “invasive,” nor how that would affect WRA outcomes, but they claim that “if evidence of crops as agronomic weeds were interpreted as invasiveness outside of cultivation,” results would be confounded. Not to debate semantics, but these tools are called “weed” risk assessments because they are intended to “help prevent the entry of weeds and invasive plants into new areas” (Koop et al. 2012). More so, WRAs explicitly allow operators to assess invasiveness in agricultural and natural habitats, and both of these scores are used to complete the assessment. The assessments were conducted as designed and concluded that most crop species posed a high invasion risk. Whether they accurately predict invasiveness in both habitats is important but not germane to this study. Without specific examples of how this issue matters, despite making our raw data available, their criticism is speculative. Even if examples had been provided, “expert users may still disagree on important scoring traits” in WRAs (Lewis and Porter 2014) that may yield different results (Cousens 2008; Pheloung et al. 1999).

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