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**PeerJ**

Manuscript Revision #2013:10:872:0:1:REVIEW

Dear Coen Ritsema,

Find enclosed our revised manuscript entitled:

“Germination of *Acacia harpophylla* (Brigalow) seeds in relation to soil water potential: Implications for rehabilitation of a threatened ecosystem*.*”

We have considered all of your comments and those of the two reviewers, and carefully itemised our responses in the following pages.

Thank you for your consideration and do not hesitate to contact me should you have any further questions or concerns.

Best regards,

Sven

On behalf of the Authors,

**Sven Arnold Yolana Kailichova Thomas Baumgartl**

**Response to Reviewer 1 (Ana Vasques)**

We (the Authors) thank Ana Vasques for her commentary towards improving our manuscript for potential publication. We have considered all comments and carefully itemised our responses as follows.

*The units of water potential used could be changed to MPa (instead of KPa) to improve the potential comparison of the results attained with other current germination studies.*

We changed the units of water potential from kPa to MPa throughout the manuscript, including the abstract, tables, and figures.

*The figure indexing should follow the order in which they are mentioned in the text (Results section).*

The figure indexing is revised and follows the order the figures are referred to in the results section. Thanks for pointing it out.

*The interpretation of the germination percentages attained under the lower water potential tested (-1.5 MPa) in comparison to water potentials present in other parts of the plant should be adjusted (lines 140-143) because seeds can have very low internal water potentials (please see Bewley et al. 2013). Furthermore, these interpretations should be left for the discussion section, being excluded from the result section (lines 115 and 116).*

We added general quantities of water potential of air-dry seeds according to Bewly et al. 2013 and revised the discussion on physiological water relations of Brigalow as follows: “[…]In general, air-dry seeds have water potential values of -50 to -350 MPa (Bewley et al. 2013). […]Qualitatively, the low seed water potential corresponds well with other investigative studies on the physiological water relations of *A. harpophylla* […].”

We disagree about the following statement being an interpretation: “Remarkably, at a water potential as low as -1.5 MPa (permanent wilting point) still 4% ± 1.8% of the seeds germinated.” (lines 115-116) This is a statement of observed findings rather than any interpretation or discussion in the context of previous studies. Moreover and given many personal discussions across the scientific community of soil scientists, we consider this finding as remarkable indeed and would like to keep it highlighted in the result section as is.

*The objectives should be clarified through a more specific research question/hypothesis. To further clarify the hypothesis underlying this study I suggest that the expected germination response under polyethylene and saline solutions (addressed in the discussion section) is also addressed in the objectives of the study.*

We revised the research objectives to address the issue of reduced seed germination under high values of salinity as observed by Reichman et al. 2006: “[…] Therefore, the primary aim of this study is to determine their germination response in relation to soil water potential. In this regard, we investigate whether reduced germination at high values of soil salinity is due to toxic rather than osmotic effects (Reichman et al. 2006). As a secondary goal … “

*The implications of the present findings for the practice of rehabilitation of post-mining areas should be further explored including the discussion of the use of seed priming in germination enhancement. Other aspects for the improvement of germination predictions, such as the use of combined models of temperature and water potential (hydrothermal models: lines 163 and 164) should also be mentioned.*

We added the aspect of combined hydro-thermal modelling to the second paragraph of section 4.1: “Moreover, together with empirical data on the effect of temperature on the germination of Brigalow seeds (Reichman et al. 2006), the findings of this study can be utilised to parameterise hydrothermal models (Bradford 2002; Bullied et al. 2012; Gummerson 1986; Köchy & Tielbörger 2007; Watt et al. 2011) for predictive modelling of germination in relation to the two environmental factors of temperature and water availability.”

With regard to practical implications of post-mining land rehabilitation other than adequate soil restoration, we added the following paragraph to section 4.1: “Apart from physical soil restoration, pre-treatment of seeds, i.e. seed priming, also plays a critical role to enhance germination (Jisha et al. 2013). Amongst the broad range of seed priming techniques, hydropriming and osmopriming are the most promising approaches for plant establishment in semi-arid climate to increase seedling growth (Yagmur & Kaydan 2008), and root and shoot length (Kaur et al. 2002). Although the exact mechanisms behind pre-treatments of seeds are not fully understood, seed priming seems to activate cell signalling pathways and cellular responses to environmental stressors resulting in faster plant defence responses (Jisha et al. 2013).”

*Lines 171-175: the importance of hydraulic conductivity could also be addressed (Bewley et al. 2013).*

Soil hydraulic conductivity can indeed become the limiting factor for seed available water when the soil is dry, i.e. the rate of unsaturated water flow is too low to maintain the seed-soil contact and hence the imbibition of water. However, as concluded by Bewley et al. 2013 (page 143), “water conductivity of a soil does not limit germination per se, [because] germination is generally inhibited at water potential values much higher than those that markedly affect soil hydraulic conductivity”. In this regard, we added the following footnote to the manuscript: “Note that soil hydraulic conductivity can become a limiting factor in dry soils (Bewley et al. 2013).”

*Section 4.2.: The discussion of the adequacy of seeding for the rehabilitation of native Brigalow ecosystems should be further clarified giving the pros and contras of this approach in contrast with the use of asexually propagation methods. Other aspects of both approaches, such as genetic diversity could also be discussed.*

At the Editor’s discretion we would like to keep section 4.2 pointing at alternative rehabilitation approaches to direct seeding rather than discussing pros and cons of direct seeding. Nonetheless, we appreciate the comment on the loss of genetic diversity when applying vegetative propagation methods, and added the following sentence to the last paragraph: “However, the flipside of such asexually propagation methods is the potential loss of genetic diversity, which can be critical if ecosystems are forced to adapt to the projected changing climate of Central Queensland (Low 2011).”

**Response to Reviewer 2 (Teresa Eyre)**

We (the Authors) thank Teresa Eyre for her motivating commentary towards improving our manuscript for potential publication. We have considered all comments and carefully itemised our responses as follows.

*Abstract, 1st line, change 'of' to 'to'; line 4, insert comma after 'soils'; line 5, change 'for' to 'of'; line 6, insert comma after 'stressors'; line 19, delete 'predominant native'; line 11 insert 'an' between 'as' and 'environmental'; line 17, delete 'facilitates'; line 18, insert 'tolerant' between 'remarkably' and 'water'; line 19, insert comma after 'stress' and delete 'tolerant'; line 25, delete 'ability of asexual reproduction' and insert 'capacity to reproduce asexually' instead. […] Introduction, line 16: delete 'bioregion' and replace with 'A. harpophylla dominant ecosystem'. The bioregiob us bit kusted as endangered, the ecosystem is. […] Discussion, line 130; replace 'under' with 'in a'.*

We thank the reviewer for pointing to the minor technical/grammatical issues, which helped to improve the revised abstract and manuscript accordingly.

*The experimental design appears sound. My only query - relevant to section 2.1, line 43 of the MS, regards where the Acacia harpophylla seeds were sourced from. Where they sourced in the field? or elsewhere. […] Findings are highly valid, and data robust and analyses statistically sound. As mentioned earlier, I would like to see stated in the MS where the seeds were sourced from.*

Seeds were collected in August 2012 from the native Brigalow catchment at the Brigalow Research Station near Theodore in Central Queensland. We added this information, as well as the reference to the Brigalow Catchment Study, accordingly as footnote to the revised manuscript.