Nitrogen, phosphorus, potassium, calcium and magnesium release from two compressed fertilizers: column experiments

M.J. Fernández-Sanjurjo, E. Alvarez-Rodríguez, A. Núñez-Delgado, M.L. Fernández-Marcos, and A. Romar-Gasalla

General comments

The manuscript describes an experiment testing the release of elements (N, P, K, Ca and Mg) in soil from controlled-release fertilizer tablets. The experimental design is correct and the research carried out has many implications for agricultural and forest fertilization practices, which is an issue of broad importance. The issue falls within the scope of Solid Earth, in the section of Soil System Science. My recommendation is "minor revision".

I have not any objection to results and conclusions. In contrast, I have some concerns in the first sections of the manuscript. The most important are:

[1] In the abstract, the authors should start enouncing the objective of your paper.
[2] The Introduction section is well written and the state of art is reviewed satisfactorily. But objectives are enounced in a too general way. I suggest highlighting the relevance of objectives in the context of the problem and background.
[3] The authors commonly refer to "nutrients". I think that "elements" or "exchangeable cations" may be much more proper terms.
[4] The methods section needs some minor revision. Some items are obvious, but require some attention.
    a. The reference list needs to be revised. I have not exhaustively revised it, but some references are not cited in the main text. Some of them are: IUSS-WRB, 2007; Jiménez-Gomez, 1992; Paramasivam and Alva, 1997.
    b. In other cases, citations are not correct (e.g. "Sato and Morgan, 2008" is cited as "Sato et al., 2008").
[5] Homogeneous criteria are necessary for chemical terms. It is not acceptable to use Phosphorus and P or Calcium and Ca even in the same sentence (see figure legends, for example).

The following are some detailed comments.

Detailed comments

Page 1556	
Line 24	"Slow acting fertilizer" is a correct term. However, I just suggest using "controlled-release fertilizer", which is more technical and may be also abbreviated as CRF through the text.
Page 1557	
Line 5	Re-write: "Most trials…fertilizers have concluded that…".
Lines 24-27	These objectives are too general and, only from it, a general relevance for science is not detected.

You should re-write your objectives highlighting the used method and the fertilizer qualities. Otherwise, this could be just another poor paper on controlled-released fertilization.
What are your strong points? Why designing and testing these fertilizers? What is the background problem? For example, I should change objective (2) in "to understand the dynamics of different nutrients and their impacts on acid forest soils and drainage water".

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Line 5 — It would be helpful if you provide the criteria for collecting the 0-20 layer. Does this correspond to the entire A horizon (umbric or mollic), part of it or part of A and B?

Line 8 — Are results reliable if sampled soil is 0-20 cm and the column is 50 cm long?

Line 10 — Explain here briefly why different NPK compositions are used.

Line 19 — According to data (columns 50 cm long and 7.3 cm in diameter and 900 g soil), I calculate:

- Volume of the column is $\pi \times (3.65\ cm)^2 \times 50\ cm = 2092.7\ cm^3$.
- Bulk density of soil in the column is $900\ g / 2092.7\ cm^3 = 0.43\ g/cm^3$.

This bulk density is too low. To simulate a bulk density similar to that in the original soil, you tapped the soil in the column. $1\ g/cm^3$ is reached if the soil body is tapped until aprox. 20 cm length in the column. So, please, can you provide the approximate final length?

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Line 3 — Continuously or periodically?

Line 23 — Substitute "exchange" with "exchangeable".

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Lines 1-2 — Although obvious, you must explain that normality of data distributions was checked (using Kolmogorov-Smirnov, Shapiro-Wilk or other tests).
Cite SPSS properly (IBM Corp., 2010): *IBM Corp. IBM SPSS Statistics for Windows. Version 19.0. IBM Corp. Armonk, NY. 2010*.

Table 1 — Why "C" in italics? Please, use "organic C", unless mineral C is included here.
Here and trough the text, K, Ca, Mg, etc. are elements. The exchangeable forms are K^+, Ca^{2+}, Mg^{2+}, etc. Strictly, these are the forms that you should use through the text.
The last line (percentage of exchangeable Al) is not necessary and should be removed.

Figure 1 — Re-write: "Acidity (pH) of …".
What is the objective of the line in control values? It is not a regression, is it? If it is just a line connecting the points, delete it.

Figures 2 and 3 — See the last comment above.