Dear Editor,

We are grateful to the Reviewers for a very thorough revision of the manuscript and the valuable remarks, which have substantially improved the scientific value and clarity of the paper. All of the Reviewers’ concerns have been addressed, and the manuscript has been revised accordingly. Below are our responses to the Reviewers’ comments.

**Reviewer 1**

**Broad comments**

**Responses to broad comments**

The aim of our study was to characterize F5 breeding lines, obtained by crossing 5 forms of spring spelt (O11, O13, K17, K18, K20), in terms of yield components, the chemical composition of grain and lodging tolerance. Those traits were the main selection criteria for qualifying the lines for further breeding. The technological properties of wheat grain and flour are usually evaluated at the end of the breeding process when the breeding material is homogeneous/characterized by a high level of homozygosity.

In the Discussion section, the results obtained for F5 breeding lines were compared with those obtained for spelt, mostly winter spelt, and spring wheat by other authors. All parameters analyzed in our study, i.e. yield components, the chemical composition of grain (content of protein, fat, ash and fiber), plant height and lodging tolerance were taken into account. Potential commercial uses of spelt grain (end-use quality, market classification and economic benefits) were not analyzed because it was not the objective of this study.

**Specific Comments**

**Line 17:** Please change "breeding lines" to "of the breeding lines".
The relevant corrections were made.

**Line 19 to 20:** Please say what makes groups III and IV different from each other.
According to “Instruction for Authors” the abstract should be a total of about 200 words maximum. Our the abstract is 190 words (after correction line 17)

**Line 21:** Please change "19.6% breeding lines" to "19.6% of the breeding lines". Also, for Group II to have been in its own group, there must have been something that differentiated it from the other groups. Please say what that was. You have described the properties of the other groups, please do the same for group two.
The relevant corrections were made. According to “Instruction for Authors” the abstract should be a total of about 200 words maximum. Our the abstract is 192 words (after corrections line 17 and 21)

**Line 28:** Please change "already" to "as far back as".
The relevant corrections were made.

**Line 37 to 38:** Please explain what you mean by "niche species"? What exactly was it being cultivated for during that time? What niche did it occupy? The reviewer has asked these same questions before and they have not been answered by the authors. If the authors are saying that the interest in spelt is being currently revived for nutritional and health benefits and breeding suitability, what was the reason during earlier times for its cultivation?
We consider spelt to be a niche species with increasing importance. According to FAOSTAT data for 2017, the total area under wheat cultivation in Europe was 62 mln ha and wheat production was 270 mln t. We are aware of the fact that the replacement of spelt with threashable bread wheat was a long-lasting process observed over centuries.

Line 38 to 40: Where is the citation for this statement?
See References number: 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54.

Line 134: What generation was the chemical analyses done on? The authors did the lodging evaluation at F5. The authors need to make it clear what generation the chemical analyses were done.
Grain was subjected to chemical analyses to determine the content of protein, fat, ash and fiber on a dry matter basis separately for generation F5 and separately for F2.

Line 135: If you did different types of methods for the protein, fat, ash and fiber, then please use the plural "analyses" instead of analysis.
The relevant corrections were made.

Line 147 to 148: The authors are insisting that two replicates are enough. They do not give reasons or proof. They need to prove that two replicates of these assays is sufficient. One way will be to provide other citations which have used only two replicates in these assays for evaluation in breeding programs. Also, the authors need to make it very clear what generation was used for these analyses. The data is a little confusing because Table 3 uses the F2 generation. However, since these have not reached homozygosity of any kind, what was the purpose of doing it so early. Why was it not done at the F5 generation instead?
According to standard PN-EN ISO 20483:2014 protein, fat, ash and fiber content for all breeding lines, parents and reference cv. Parabola was determined in two replications. F5 breeding lines are the result of field and laboratory experiments conducted over several years. In breeding programs, we are faced with the succession of generations F1, F2, F3, F4, F5. This experiment involved F5 generation, and the study aimed to compare breeding lines under identical environmental conditions. In our opinion, and according to standard PN-EN ISO 20483:2014, in an analysis of the chemical composition of grain, two replications are sufficient to compare breeding lines at early stages of breeding under identical environmental conditions. The chemical analyses F2 generation were done only for evaluate variation of traits (See Table 3.)

Line 175 to 176: I think the authors mean to say "% [DM]" as opposed to "% DM". If so, please make the brackets complete.
The relevant corrections were made.

Line 198: There needs to be a space between O11 and paternal.
The relevant corrections were made.

Line 201 to 204: Why was the chemical analyses done so early in the breeding program? The rest of the analyses was done at F5, why was the protein, ash, fat and fiber content not also done at F5? At F2, the values obtained may differ than those obtained at F5 where there is a greater amount of homozygosity.
The chemical analyses F2 generation were done only for evaluate variation of traits (See Table 3.). The aim of this study was to evaluate F5 breeding lines of spring spelt in terms of yield components, the chemical composition of grain and lodging tolerance with the use of two-way joining cluster analysis.

Line 296 to 300: As far as the reviewer is able to tell, certain values were collected at F5 where there was greater homozygosity and other values were collected at F2 where there was less homozygosity. The authors need to thoroughly explain why they did some of the chemical analyses at F2 when they could have been done at F5 and then combined with other F5 analyses for the subsequent cluster analysis.

The chemical analyses F2 generation were done only for evaluate variation of traits (See Table 3.). The aim of this study was to evaluate F5 breeding lines of spring spelt in terms of yield components, the chemical composition of grain and lodging tolerance with the use of two-way joining cluster analysis.

Line 304: From the previous data presented, the cluster analysis seems to be a mix of F2 and F5 data. This is extremely inconsistent especially since many parameters measured at F2 could easily change as more homozygosity is achieved. This could in turn change the cluster analysis. Please be consistent in the data used to make the heatmap and dendogram. If the chemical analysis needs to be repeated at F5, that must be done. Drawing conclusions from data obtained in very different generations can be extremely erroneous.

The basis of multivariate two-way joining cluster analysis was ONLY generation F5. We never mixed of F2 and F5 data. See: i) The aim of this study, ii) The figure 5 caption: “A heatmap and a dendrogram of F5 breeding lines of spring spelt and their parents.”

Line 322 to 323: Please give the descriptions of the lodging scale next to the relevant numbers.
See the Materials and Methods, subsection 2.2.

Line 357: The table caption needs to be more descriptive.
The relevant corrections were made.

Line 379 to 381: Please expand on what the previous research has found about the milling quality of spelt as well as its suitability for the production of functional foods.
All parameters analyzed in our study, i.e. yield components, the chemical composition of grain (content of protein, fat, ash and fiber), plant height and lodging tolerance were taken into account. Potential commercial uses of spelt grain (end-use quality, market classification and economic benefits) were not analyzed because it was not the objective of this study.

Line 442 to 446: What do these results imply for the breeding lines developed?
This is description our research

Line 452 to 460: The results seem to indicate that the ash content of the breeding lines is higher than the accepted value of 1.7%. The authors need to discuss the implications of these results. For example, do the results indicate that the breeding lines that the authors have developed are unsuitable? How do the authors intend to correct this issue? How have other research groups handled this issue?
The answer is in this same section: “(...) The ash content of common wheat grain for baking white bread should not exceed 1.7%. Spring wheat grain is generally more abundant in ash than winter wheat grain, and spelt grain contains more ash than bread wheat grain [65, 66] (...). High ash content delivers health benefits, but it is also responsible for a darker color of flour and inferior technological properties.”

Line 465 to 473: The authors need to discuss the implications of these results. What is the interpretation of the results obtained? What are the impacts of their results? Which other research groups have achieved results similar or different to what the current researchers obtained?

The aim of this study was to evaluate F5 breeding lines of spring spelt in terms of yield components, the chemical composition of grain and lodging tolerance with the use of two-way joining cluster analysis.

Line 489 to 490: Please explain the reason for the height limitation in spelt.

The aim of this study was to evaluate F5 breeding lines of spring spelt in terms of yield components, the chemical composition of grain and lodging tolerance with the use of two-way joining cluster analysis.

Line 490 to 494: The authors need to interpret their results. What do their results mean for the future of the breeding lines they have developed? Is there a level of minimal lodging that will be acceptable? Will they have to do backcrosses? What options are available to them?

We do not agree with the Reviewer's opinion. In the Discussion section, the results obtained for F5 breeding lines were compared with those obtained for spelt, mostly winter spelt, and spring wheat by other authors. All parameters analyzed in our study, i.e. yield components, the chemical composition of grain (content of protein, fat, ash and fiber), plant height and lodging tolerance were taken into account. Potential commercial uses of spelt grain (end-use quality, market classification and economic benefits) were not analyzed because it was not the objective of this study.

Line 196 to 197: Please provide pictures of these morphological descriptions
The relevant corrections were made. See new Fig. 4.

Line 208 to 210: Please provide pictures of these morphological descriptions.
The relevant corrections were made. See new Fig. 4.

Line 213 to 214: Please provide pictures of these morphological descriptions.
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Line 220 to 223: Please provide pictures of these morphological descriptions.
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Line 224 to 225: Please provide pictures of these morphological descriptions.
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Line 228 to 231: Please provide pictures of these morphological descriptions.
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Line 248 to 249: Please provide pictures of these morphological descriptions.
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Line 313 to 314: Please provide pictures of these morphological descriptions.
We showed values and statistical analysis here. In our opinion, pictures are not necessary here.

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