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Review

of doctoral dissertation submitted by **Ali Hulail Noaema, MSc**,
entitled: **“The effectiveness of foliar fertilization of several cultivars of potato
(*Solanum tuberosum* L.) under conditions of the South-Eastern Poland”**

The review was prepared as requested by the Council of the Faculty of
Agrobioengineering, the University of Life Sciences in Lublin
as well as the Dean, Professor Krzysztof Kowalczyk.

The doctoral dissertation was prepared under the guidance of
the supervisor, Professor Barbara Sawicka,
and an auxiliary supervisor, Dr Anna Kiełtyka-Dadasiewicz

Topic selection and justification

Potato (*Solanum tuberosum* L) is a crop plant of vital importance in Polish, European and global agriculture. After wheat, rice and maize, it is the fourth most important staple food consumed by the global human population, and is cultivated in over 160 countries. The nutritional value of potato stems from tuber chemical composition whose components are important in human nutrition. The components include: starch, total sugars, reducing sugars, protein rich in exogenous amino acids, dietary fibre, vitamin C, B₁, B₂, B₆ as well as numerous macroelements and microelements. Both potato yield and composition may be significantly affected by agrotechnological factors.

Fertilisation is one of basic agrotechnology elements in terms of potato tuber yield and quality. Due to a long period of nutrient uptake and large biomass of potato

yield, it is vital that plants receive an optimal supply of nutrients throughout the whole growing season, that is starting with fertilisation applied prior to tuber planting, and finishing with supplementary (foliar) fertilisation applied when plants grow and develop. As a result of complex and so complete supply of potato plants with readily available nutrients, their physiological processes progress appropriately and the root system develops well, which translates into the formation and growth of tubers of suitable quality. The effectiveness of applied fertilisation depends on e.g.: soil conditions (agronomic category, pH, humus content and nutrient content), precipitation and thermal conditions when plants grow (rainfall and air temperature) as well as fertilisers used.

At some potato plant development stages, nutrients are taken up particularly rapidly and conventional soil fertilisation does not always assure their availability. Nutrient deficiency at the stage of the highest demand by plants may occur in fertile soils, e.g. during a periodic drought, due to some elements being trapped as a result of inappropriate soil pH or their mutual antagonistic action. Thus, when this is the case, it seems fully justified to replenish the nutrients not only by the root system but also by foliar application.

Moreover, the amount and type of fertilisation may significantly affect potato tuber yield and its structure as well as tuber chemical composition and, as a result, influence the quality parameters of potatoes destined for direct consumption and processing.

Taking the above into consideration, I believe the title of the dissertation '*The effectiveness of foliar fertilization of several cultivars of potato (Solanum tuberosum L.) under conditions of the South-Eastern Poland*' fully reflects the research topic and properly informs about the study subject and scope. Moreover, the topic of the dissertation is apt and up-to-date, and has both a cognitive and practical value. Also, the succinct and well-phrased title of the dissertation adds to its value.

Dissertation structure

The doctoral dissertation submitted for review by Mr Ali Hulail Noaema, entitled as indicated above, consists of 200 pages of standard typewritten text (including tables, figures, References, Abstract and Appendices). From the formal perspective, the dissertation is appropriately structured, contains eight main chapters with logical progression of thought (Introduction, Literature review, Material and

Methods, Conditions of the Research, Results, Discussion, Conclusions, References) as well as four chapters in the form of appendices (List of Tables, List of Figures, List of Photos, Appendices), chapters 1, 2, 3, 4, 5 and 6 being further divided into sub-chapters. Such a layout enhances readability, makes it easier to analyse the content, and follows the generally accepted structure of research papers and doctoral dissertations. The dissertation is carefully written and no substantive objections can be raised.

Choice and Utilisation of Literature

In his dissertation, the candidate referred to a total of 468 source materials, all of them relevant in terms of subject area (the number of sources is truly impressive). The references cited include research papers, chapters from monographs, books and popular science literature. It should be stressed that many references are recent publications, including foreign language literature, which indicates that the candidate has a very good knowledge of and is familiar with the current literature relevant to the subject matter of the candidate's research.

There are several aspects of the dissertation which should be addressed/improved while preparing the work for publication. They are as follows:

- before the dissertation is published, attention should be paid to the spelling of the surnames of Polish authors cited. Due to the complexity of the Polish language, the original spelling of the names should be used, including Polish diacritics, e.g.: Pszczółkowski instead of Pszczolkowski, Kołodziejczyk instead of Kolodziejczyk, Gołąb instead of Golab, Zgórska instead of Zgorska, etc.;
- the following works cited in the main body: Nowacki (2016), Timprasert et al. (2014), Laczynski (2016), Sapek (2014), Klem-Marciniak (2015), Murawska et al. (2015), Tarczewski (2013), Boligłowa (1995), Grudzińska and Zgórska (2006), Płaza (2011b), have not be included in the References chapter;
- The following works listed in References have not been cited in the main body of the dissertation:
 - Chairidchai, P. 2000. The relationships between nitrate and molybdenum contents in pineapple grown on an incept sol soil. *Acta Horticulture* 529: 211–216,

- FAO. 2012. FAO Statistical Yearbook 2010: Fishery and aquaculture statistics. Food and Agriculture Organisation of the United Nations, Rome, 78. Available at: http://www.fao.org/docrep/015/ar.n081rn00.htm#contents_er1,
- Frydecka-Mazurczyk, A. 1993. Raw material to french-fries and chips production. *Potato of Poland* 3: 9-13,
- GUS. 2015. Statistical Yearbook of Agriculture. Central Statistical Office. Warsaw, pp: 456,
- Laudanski, Z., Mankowski, D. 2007. Planning and statistical inference in agricultural research. Teaching materials. The Plant Breeding and Acclimatization Institute (IHAR) – National Research Institute. Radzikow. pp 142. http://www.ihar.edu.pl/index_en.php,
- Michalojc, Z., Szewczuk, C. 2003. Theoretical aspects of foliar nutrition of plants. *Acta Agrophysica* 85: 9–17,
- Tretowski, J., Wojcik, A.R. 1991. Methodology of agricultural experiments. Publisher: Agricultural and Pedagogical University in Siedlce: 331–334. (in Polish),
- Zgorska, K. 1994. Elements of food technology of potato to nutritive purposes. *Proc. Sci. Conf. Bonin* 22.02; 67-78. (in Polish),

- minor typographical errors have been spotted as well.

Material and Methods

The chapter Material and Methods contains a clear presentation of methodological assumptions of the field experiment which was conducted in 2015-2017. The field research, measurements, calculations and chemical analyses were appropriate in terms of methodology, which led to results being statistically analysed and conclusions being properly drawn.

Analysis of the contents of this chapter yielded the following questions:

- Would it not be better to combine chapter 4 (Conditions of the Research) with chapter 3 (Material and Methods)? In my opinion, the chapters would form a coherent section.
- Why was it not a rule to use the same preceding crop (that is cereals) in all the study years? After all, oil seed rape cultivated before the potato crop may have affected the chemical composition of potato tubers examined in the study.

- Meteorological conditions over the study period were compared to long-term means calculated across 43 years. Would it not be enough to refer to the last 15 years?
- Tuber division into the following fractions: 35, 36-50, 51-60, <60 mm, does not follow methodology presented in Roztropowicz et al. (1999) (as the author claims) but the Regulation of the Minister of Agriculture and Rural Development on detailed requirements for potato trade quality of 2003, Dz. U. [Journal of Laws] No 194, item 1900.

Results

The chapter forms the principal part of the dissertation and is an original accomplishment of the author, Mr Ali Hulail Noaema. It consists of 55 pages and is divided into 5 sub-chapters which are further divided into 18 sections. The author presents a detailed analysis of the effect of the experimental factors, that is cultivars and foliar fertilisation regime on the following characteristics: yield quantity, yield structure, potato tuber chemical composition, and the quality of chips and crisps. The study results are correctly described and skilfully interpreted, which indicates that the author has been well prepared for the analysis of the results of his research.

The following discrepancies, which need to be addressed prior to publication, have been noticed while analysing the contents of this chapter:

- tuber chemical composition (dry matter, starch, crude fibre, total sugars) ought to be expressed in generally accepted SI units, that is $\text{g}\cdot\text{kg}^{-1}$, and not as percentages. The same applies to vitamin C (not $\text{mg}\cdot 100\text{g}^{-1}$ but $\text{g}\cdot\text{kg}^{-1}$). Some units used for fat values are correct and thus do not need to be changed;
- also total yield and marketable yield should be expressed in SI units ($\text{Mg}\cdot\text{ha}^{-1}$);
- captions which accompany figures should be placed below each figure.

Discussion

Discussion is the next chapter of the dissertation and it includes 37 pages. The contents of this chapter follow a chronological, logical and in-depth reasoning pattern. The candidate appropriately and accurately referred his findings to the results reported in the literature he cited, noticing both similarities and differences, which is indicative of the candidate's good knowledge of the issues he researched.

Conclusions

The author of the dissertation summarised it by drawing 8 conclusions which contain the most important findings of the research. They are logical and fully pertain to the purpose of the study. However, in my opinion, they are too detailed and should be more generally and succinctly worded.

Summary and evaluation of the dissertation as a whole

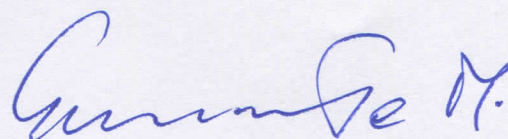
To sum up, the candidate conducted time-consuming studies which are interesting in terms of practical application. Numerous references and exhaustive results which were accurately interpreted indicate that the author is a hard-working and mature researcher. The dissertation is written using appropriate English, and coherent and clear structure of the work deserves recognition. The dissertation as a whole indicates that Mr Ali Hulail Noaema has successfully accomplished the task he undertook, and the dissertation makes a valuable original contribution to agricultural science and practice. The suggestions outlined above are in large part a matter of discussion and editorial in character and in no way diminish the substantive and scientific quality of the doctoral dissertation.

Final conclusion

To sum up, I affirm that the doctoral dissertation by Mr Ali Hulail Noaema, entitled *'The effectiveness of foliar fertilization of several cultivars of potato (Solanum tuberosum L.) under conditions of the South-Eastern Poland'*, submitted to me for evaluation meets all the standards required to justify the award of a PhD, that is, the requirement of originality of results obtained in a field experiment, measurements, laboratory analysis, statistical analysis, exhaustive interpretation and discussion of the results as well as logical and accurate inference. Moreover, the field and laboratory research conducted is up-to-date and contribute direct guidelines to be applied in agricultural practice. Taking the above into consideration, my evaluation of the dissertation is unequivocally positive and, following Art. 13 of the *Act on Academic Degrees and Academic Title and Degrees and Title in Art of 14 March 2003* (Dziennik Ustaw [Journal of Laws] No. 65 item 595, as amended), I recognise it as an original solution to a scientific problem in the field of Agricultural Sciences, in the discipline of Agronomy.

On the basis of what is stated above, I recommend to the High Council of the Faculty of Agrobioengineering, the University of Life Sciences in Lublin, that Mr Ali Hulail Noaema is granted permission to proceed with the public defence of his dissertation.

Siedlce, 4 May 2018



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