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## FERTILIZATION EFFICIENCY EVALUATION IN RELATION TO WHEAT STARCH CONTENT

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**Abstract:** The study evaluated the performance of mineral fertilization on wheat crop, Alex variety, in relation to the starch content of grains. Nitrogen was applied in five doses (0 – 200 kg ha<sup>-1</sup>; variation step 50 kg). On each nitrogen level, the Super Fifty biofertilizer was applied in six doses (0 – 5 L ha<sup>-1</sup>; variation step, 1 L). The starch content in wheat grains was determined on the experimental variants. The Agronomic Efficiency (AE) and Partial Factor Productivity (PFP) indicators were calculated. Mann-Kendall train test confirmed the decreasing trend in the data series for AE in relation to the SF variable on nitrogen levels N0, N150 and N200 ( $S = -8$ ,  $p = 0.042$ ), and for PFP in relation to the SF variable (Super Fifty) on all nitrogen levels, ( $S = -10$ ,  $p = 0.0083$ ). Based on similarity, the experimental variants were grouped into three distinct clusters (Coph.corr. = 0.963). Polynomial models and graphical models in 3D format and in isoquant format described the variation of the AE and PFP indices in relation to the independent variables (N, SF) under statistical safety conditions.

### • Introduction

Wheat is the main cereal crop in the world, with high importance for human nutrition, industrialization, animal feed, and a major role in food security [6], [9], [13]. Due to the importance of wheat for food security, new areas have been considered for the expansion of wheat cultivation [7], [21]. Some studies have analyzed the distribution of wheat crops in relation to climate change and socio-economic conditions [17]. In different types of agricultural systems, conventional or organic, wheat is a crop that occupies an important place in the crop structure [11], [4], [15]. Wheat yield and quality indices were analyzed in relation to the agro-ecological conditions of the crop area, the impact of the environment, and agrotechnical cropping systems [8], [22].

### • Material and method

The experimental wheat crop, the Alex variety, was placed within the University of Life Sciences "King Mihai I" from Timisoara, Didactic and Experimental Resort (DER), during the agricultural years 2018 - 2022. Nitrogen was applied in five doses 0, 50, 100, 150, and 200 kg ha<sup>-1</sup> a.s. (a.s. – active substance). At each nitrogen level, six doses of algae-based biostimulant (Super Fifty - SF) were applied in six doses, 0, 1, 2, 3, 4, and 5 L ha<sup>-1</sup>. This resulted in 30 experimental variants. The starch content ST, (%) was determined from annual wheat grain samples, for each experimental variant. The efficiency of using the Super Fifty (SF) biostimulant on the starch content of wheat was evaluated by the Agronomic Efficiency (AE) index [10], [16], Equation (1), and the Partial Factor Productivity (PFP) index [16], Equation (2).

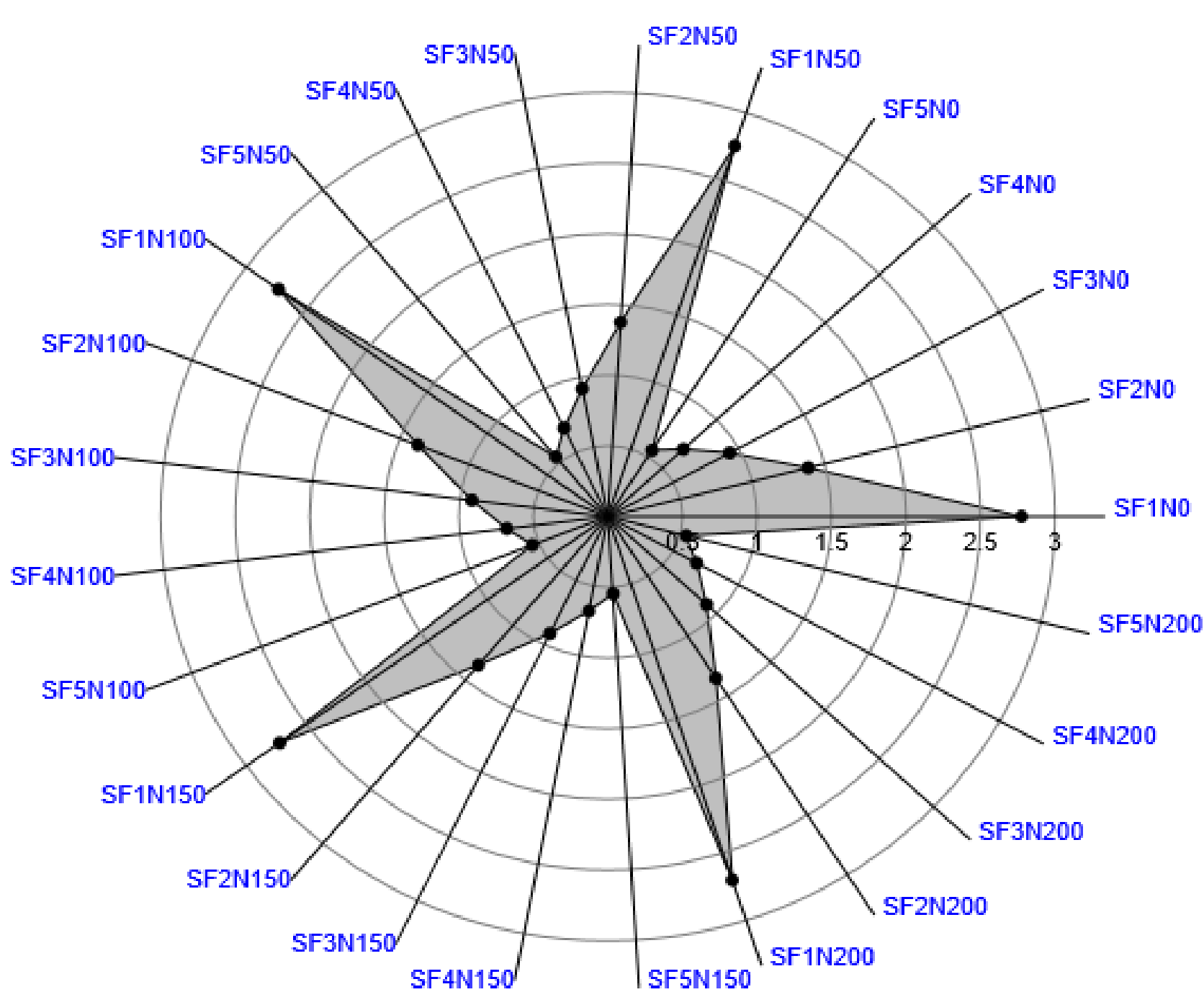


Figure 2. Graphical distribution of PFP values for wheat, 'Alex' variety

### • Results and discussions

The results for Agronomic Efficiency (AE) calculated based on the gluten content of wheat grains, in relation to the application rates of the Super Fifty biostimulant at each nitrogen fertilization level are presented, Figure 1. In the case of Partial Factor Productivity (PFP), calculated based on the gluten content of wheat grains, in relation to the doses of the Super Fifty biostimulant, at each level of nitrogen fertilization, are presented in Figure 2. According to the Cluster Analysis, the variants were grouped based on similarity in different clusters and subclusters, in relation to the values of the AE and PFP indices (Coph.corr. = 0.963), Figure 3.

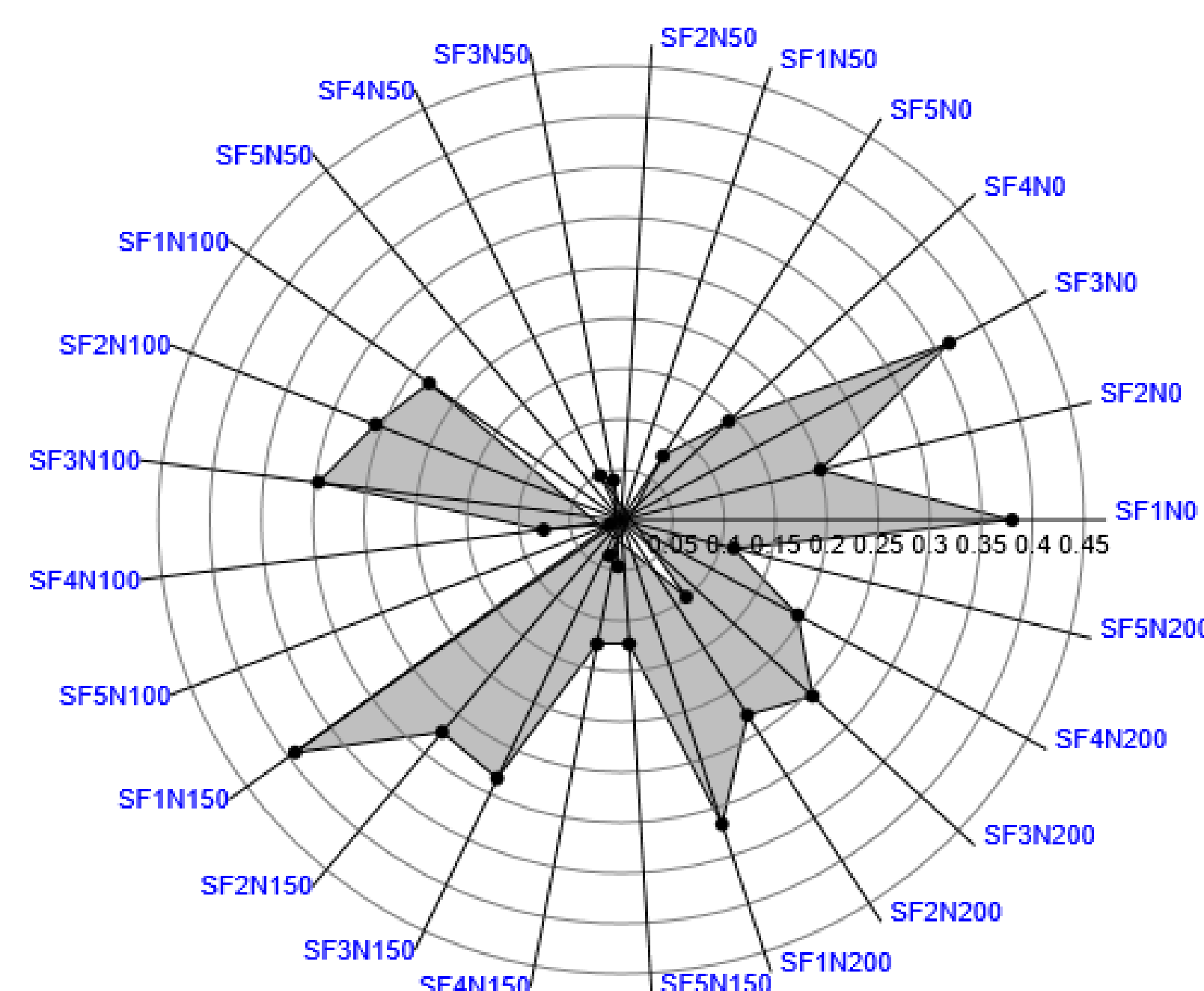


Figure 1. Graphical distribution of AE values for wheat, 'Alex' variety

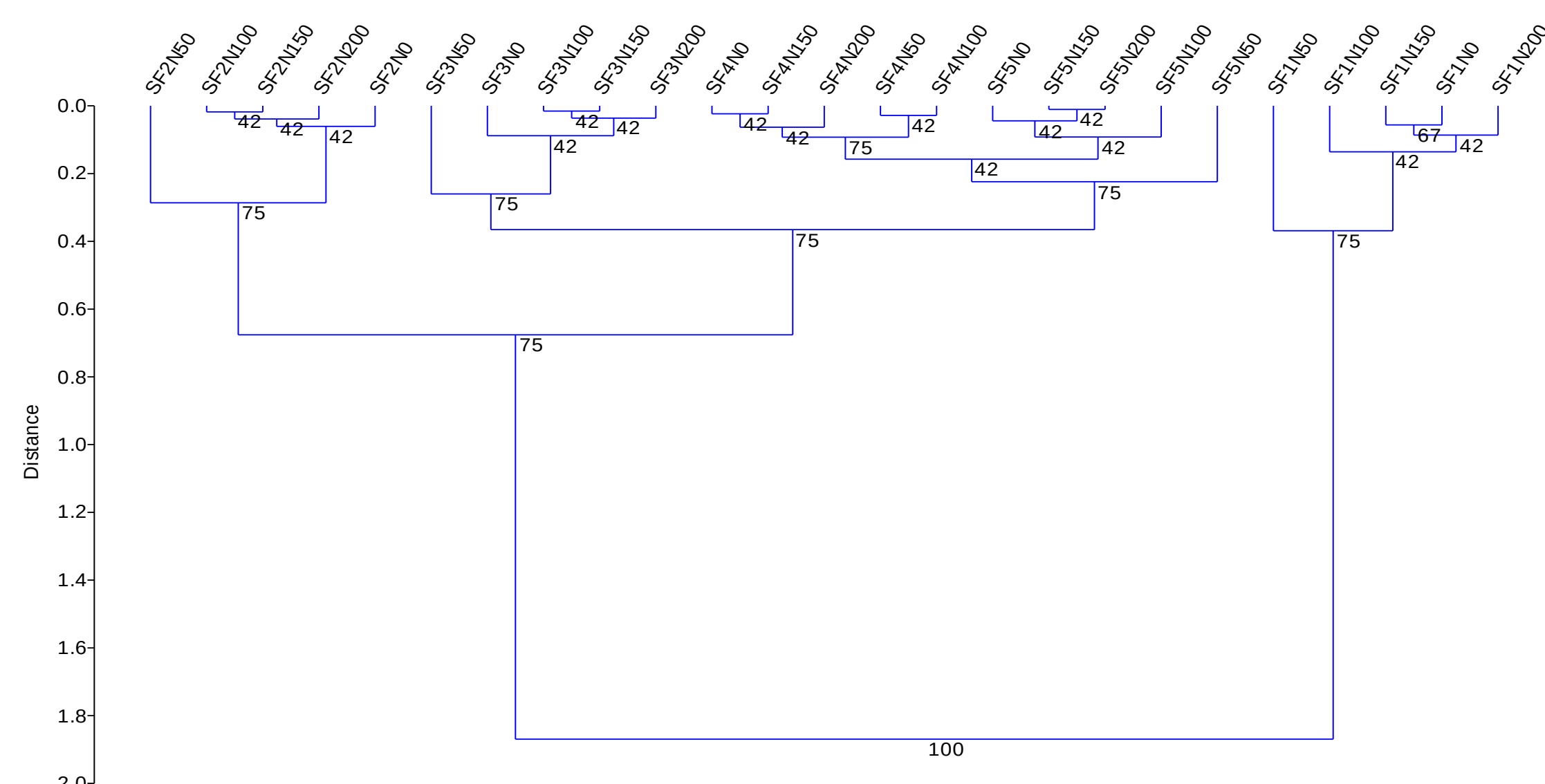


Figure 3. Cluster dendrogram based on AE and PFP indices

### • Conclusions

Fertilization with nitrogen (N) and the Super Fifty (SF) biofertilizer, based on seaweed extract, influenced starch accumulation in wheat grains, Alex variety, in a differentiated manner. Based on starch content, agronomic efficiency (AE) and partial factor productivity (PFP) indices highlighted the performance of fertilization with the two products. Kruskal-Wallis test for equal medians, indicated significant differences between the median values of the calculated AE index in relation to nitrogen doses ( $p = 0.0236$ ) and indicated that there were no significant differences between the median values of the PFP index in relation to nitrogen doses ( $p > 0.05$ ). Cluster analysis generated the grouping of experimental variants based on similarity, in relation to the AE and PFP indices. Regression analysis led to polynomial models and graphical models (3D, isoquants), which described the variation of the AE and PFP indices in relation to the independent variables (N, SF) under conditions of statistical certainty.

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