



LEAF AREA EVALUATION IN *Solanum nigrum* L. BASED ON FOLIAR PARAMETERS

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Abstract: The study investigated the leaf area of *Solanum nigrum* L. by non-destructive method. Images of the leaves were analyzed imagistically and scanned leaf area (SLA) values were obtained. The foliar SLA index registered values between $11.481 - 32.878 \pm 0.967 \text{ cm}^2$. The parameter L had values between $5.40 - 9.90 \pm 0.206 \text{ cm}$, and the parameter w had values between $3.25 - 6.45 \pm 0.151 \text{ cm}$. To determine the leaf area based on foliar parameters (Measured Leaf Area - MLA), a relation of type $MLA = L \cdot w \cdot CF$ was used, where CF represented the correction factor for the studied specie. The MLA values obtained, at $CF = 0.52$, showed a normal distribution. The experimental data set presented statistical certainty, according to ANOVA test ($F > F_{crit}$, $p < 0.001$). The variation of MLA as a function of leaf length (L) was described by a polynomial equation of degree 2, in statistical safety conditions, according to $R^2 = 0.875$, $p < 0.001$. The variation of MLA as a function of leaf width (w) was described by a linear equation, in statistical safety conditions, according to $R^2 = 0.942$, $p < 0.001$.

• Introduction

Solanum nigrum L. is a species that belongs to the *Solanaceae* Family. It is widespread throughout the world, on all continents, from tropical areas to temperate zones (SÄRKINEN et al., 2018; CAMPISI et al., 2019).

The leaves and fruits of *Solanum nigrum* have been studied in relation to the active principles they contain, of pharmaceutical, medicinal, and functional food interest (JAGATHEESWARI, 2013; PATEL et al., 2014; WANG et al., 2015; CAMPISI et al., 2019).

As a weed in crops, *Solanum nigrum* has been studied in relation to the biology of the species, vegetation requirements, relationship with soil, ability to compete, ability to multiply, control methods, compatible herbicides and efficiency, integrated management methods, etc. (COLEMAN et al., 2020).

Physiological indices and biometric parameters have been studied in *Solanum nigrum*, as growth indicators, in relation to soil water content (MCGIFFEN et al., 1992), in relation to mineral and organic fertilizers (BVENURA and AFOLAYAN, 2014), in relation with the plant preferences to soil (COLEMAN et al., 2020).

The present study evaluated the leaf area of *Solanum nigrum* L. based on the biometric parameters of the leaves and a correction factor.

• Material and method

The study analyzed a set of leaf samples from the species *Solanum nigrum* L. in order to determine the leaf area by the non-destructive method. Leaves from the species *Solanum nigrum* L. were randomly collected from the agricultural area adjacent to Timișoara, figure 1.



Fig. 1. *Solanum nigrum* L. - sample from the set of leaves studied

The leaves were measured to obtain the dimensions of the leaf parameters, length (L) and width (w).

The correction factor adjusts the calculation of the leaf area with very high precision. In order to find out the optimal value of CF, in the case of the studied leaf samples, in the *Solanum nigrum* L. specie, the model proposed by SALA et al. (2015) was used.

The processing and statistical analysis of experimental data (HAMMER et al., 2001) was done in conditions of high statistical safety (ANOVA test, correlation analysis, regression analysis; safety coefficients R^2 , r, p, RMSEP).

• References

- BVENURA, C., AFOLAYAN, A.J., 2014 - Growth and physiological response of *Solanum nigrum* L. to organic and/or inorganic fertilizers. Journal of Applied Botany and Food Quality, 87: 168-174.
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• Results and discussions

The experimental data set resulting from the measurements and digital analysis of the scanned leaves included values for leaf length (L), leaf width (w), scanned leaf area (SLA), with the graphical distribution in figure 2. The parameter L had values between $5.40 - 9.90 \pm 0.206 \text{ cm}$, the parameter w had values between $3.25 - 6.45 \pm 0.151 \text{ cm}$, and the SLA had values between $11.481 - 32.878 \pm 0.967 \text{ cm}^2$.

In conditions that the minimum errors mean (MEM) recorded the lowest value, table 1, figure 3, was considered optimal for CF. This was recorded at the value $CF = 0.52$, and this value was considered optimal for finding the MLA in the conditions of the studied leaf samples, in the species *Solanum nigrum* L. The safety parameter RMSEP, relation (2), table 1, confirmed the optimal value for CF. The values for measured leaf area (MLA), in the case study of the leaf samples, *Solanum nigrum* L. specie, were within a normal distribution, figure 4.

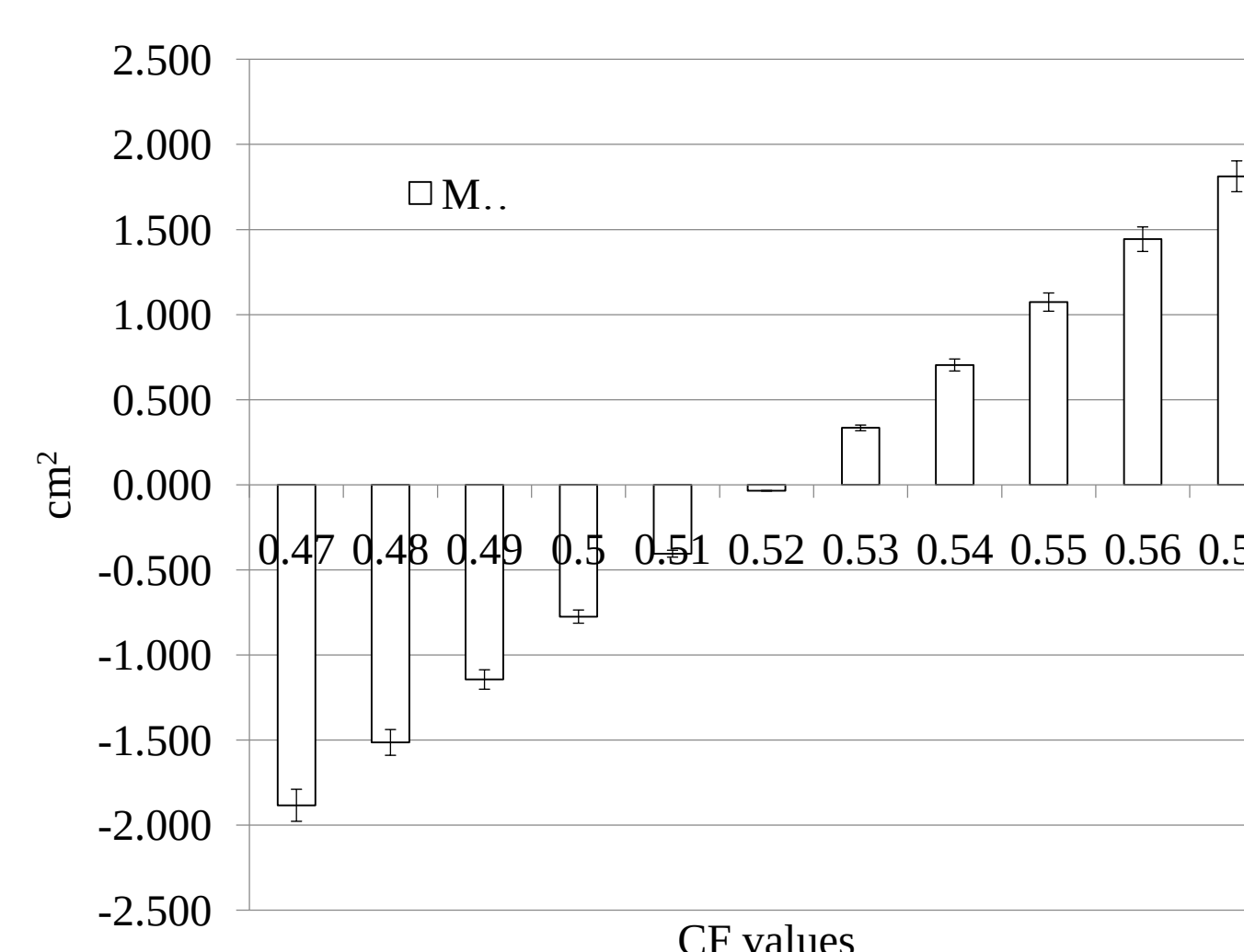


Fig. 3. Graphic distribution of MEM values, depending on CF in leaf samples, *Solanum nigrum* L. specie

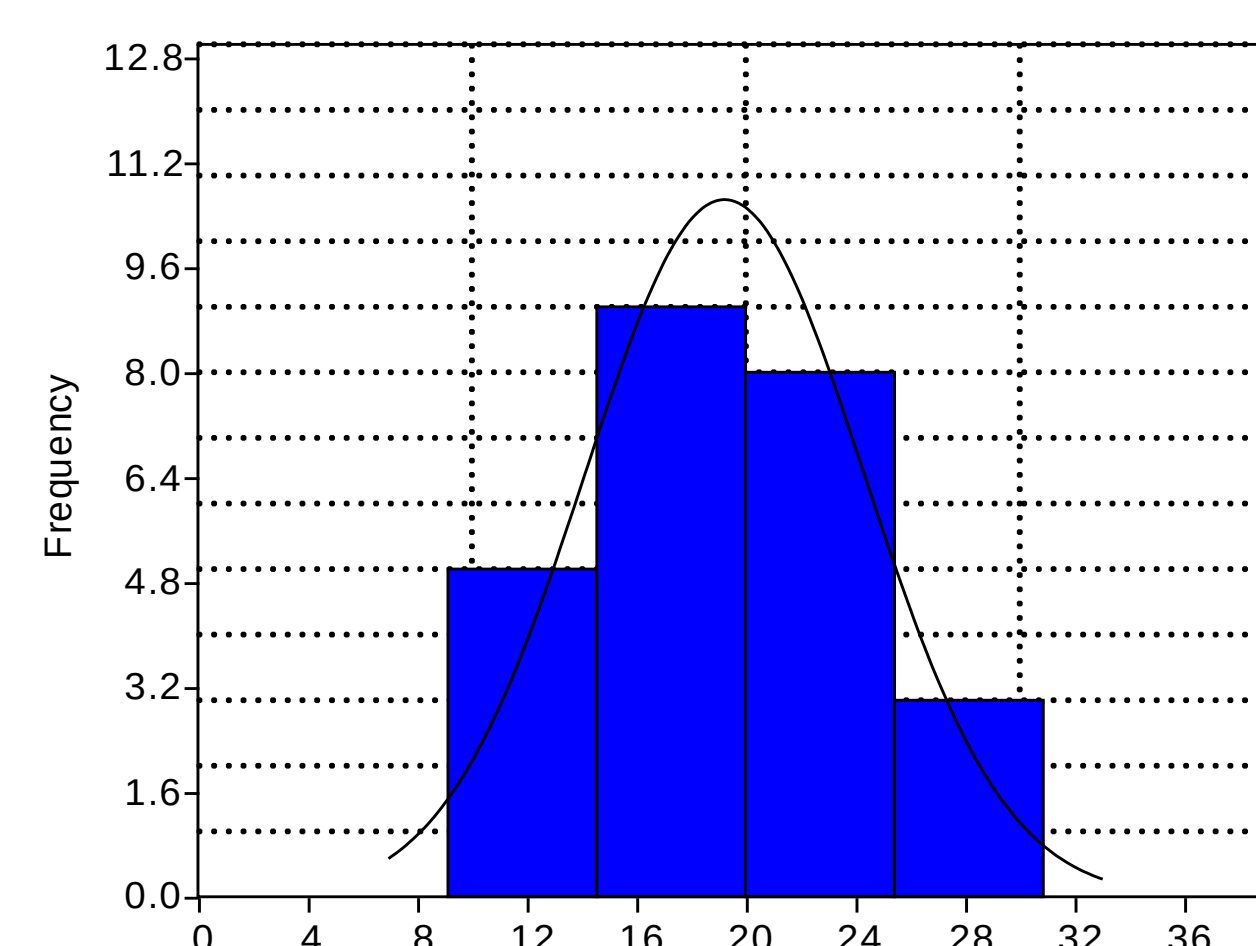


Fig. 4. Normal distribution of values obtained for MLA, corresponding to $CF = 0.52$ at *Solanum nigrum* L. leaves

• Conclusions

For the set of leaf samples, the species *Solanum nigrum* L., the correction factor $CF = 0.52$ was found, which facilitated the determination with high precision of the measured leaf area (MLA) based on the leaf parameters L, and w. Polynomial and linear models described the interdependence relationship between MLA and L, respectively w, in statistical safety conditions.