ANNALS OF THE UNIVERSITY OF CRAIOVA

Series: ✓*Biology*
✓*Horticulture*
✓*Food products processing technology*
✓*Environmental engineering*

Vol. XXXI (LXVII) - 2026

ANALYSIS OF SOME MORPHOLOGICAL AND PRODUCTIVITY PARAMETERS IN *Myrtus communis* L. UNDER POT CROP CONDITIONS

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Keywords*: agronomic parameters, fruit yield, myrtle, mathematical models, plants status*

ABSTRACT

The study evaluated morphological and productivity parameters of Myrtus communis L. plants. The experiment was conducted within the "Atmosfera Verde" Nursery in the area of the University of Life Sciences "King Mihai I" from Timisoara. The myrtle plants were cultivated in pots with a volume of 10 dm^3, in a substrate of horticultural peat (80 %) and perlite (20 %). The plants were 4 years old at the time of experimental observations, November 2025. Plant height (PH) showed low variability (CV = 7.62), mean stem number (MSN) showed moderate variability (CV = 27.13), and fruits number on plant (FNP) showed high variability (CV = 40.54). Polynomial mathematical models and graphical models (3D model, and isoquants) described the variation of FNP in relation to PH and MSN, in statistical safety conditions.

INTRODUCTION

Myrtle is part of the *Myrtaceae* Family, and is widespread in Europe, North Africa, Asia, especially in the Mediterranean area, but is also distributed in South America, Australia, the Northwestern Himalayas (Migliore et al., 2012; Anwar et al., 2016; Dabbaghi et al., 2023). *Myrtus communis* L. (commonly known as myrtle) is the only species of the genus *Myrtus* found in the Northern Hemisphere (Traveset et al., 2001).

Myrtus communis is a plant in the form of a shrub or small tree, evergreen, and includes about 50 species native to the Mediterranean Basin (Anwar et al., 2016). Myrtle species have been described with a high content of bioactive compounds (e.g. phenolic acids, fatty acids, flavonoids, anthocyanin pigments, tannins, volatile oils, etc.), with antibacterial, antifungal, antioxidant properties (Anwar et al., 2016; Nicoletti et al., 2018; Mërtiri et al., 2025; Gündüz and Akgül, 2026). Myrtle is widely used in the food, pharmaceutical and cosmetic industries based on the active principles it contains (Giampieri et al., 2020).

Common myrtle is a species with high tolerance to drought and water stress conditions (Sirca et al., 2008). Different myrtle genotypes, within a collection of 22 varieties, responded differently to climatic and cultivation location conditions, in relation to the content of accumulated phenolic compounds (Medda et al., 2022). Through multivariate analysis, the study authors explained the association of some

categories of bioactive compounds with climatic conditions, with the cultivation location, and obtained the grouping of genotypes based on similarity of response (Medda et al., 2022).

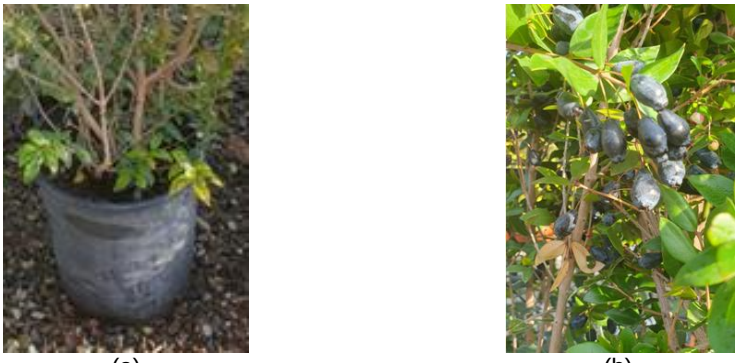
As a result of the high demands for myrtle (biomass, fruits) for processing purposes, interest has developed in the cultivation of myrtle plants in various breeding and cultivation systems (Sirca et al., 2008; Tafreschi et al., 2021). Under conditions of moderate water stress, myrtle plants showed a photosynthetic rate higher than under conditions of good water supply (Sirca et al., 2008).

The variation of some agronomic parameters in myrtle plants, cultivated in a protected system (greenhouse) was analyzed under conditions of controlled inoculation in the soil with mycorrhizal fungi and rhizobacteria (Azizi et al., 2022). The authors of the study reported favorable effects of controlled inoculation for the purpose of plant propagation and obtaining vigorous seedlings for future myrtle crop systems and plantations, or for the restoration of natural habitats (Azizi et al., 2022).

The present study evaluated agronomic and productivity parameters in *Myrtus communis* L. plants, under potted growth conditions, and described the interdependence of parameters and the variation of the number of fruits per plant (FNP) in relation to morphological parameters of the plants.

MATERIAL AND METHODS

The study was conducted within the "Atmosfera Verde" Nursery, on the premises of the University of Life Sciences "King Mihai I" from Timisoara. *Myrtus communis* L. plants were grown in pots with a volume of 10 dm^3. A substrate consisting of horticultural peat (80 %) and perlite (20 %) was used, Figure 1. The plants were 4 years old.



(a) (b)

Figure 1. Aspect from the experiment: (a) – pot with myrtle plants; (b) – plants with fruits

Watering was done periodically, at a moderate level, with a uniform volume of water for each pot (plant) to ensure an adequate humidity level. Water collected from precipitation was used. The determinations and data recording were made on November 15, 2025. Plant height (PH, cm), number of main stems (MSN) and number of fruits per plant (FNP) were determined. The determinations were made on 15 plants. PAST software v.4.14 (Hammer et al., 2001), and Mathematica software v.14.2. (2024) were used for data analysis and generation of graphical representations.

RESULTS AND DISCUSSIONS

Descriptive statistical analysis of the data series (N = 15) highlighted the values of the main parameters, Table 1. Plant height (PH) presented values from 103±2.26 cm to 129±2.26 cm. The number of main shoots per plant (MSN) presented values from 4±0.44 to 9±0.44. The number of fruits per plant (FNP) presented values between 83±23.36 to 323±23.36.

Table 1

Parameter values of the studied *Myrtus communis* plants

Statistical parameters	PH	MSN	FNP
N	15	15	15
Min	103	4	83
Max	129	9	323
Mean	114.73	6.33	223.13
Std. error	2.26	0.44	23.36
Stand. dev	8.75	1.72	90.46
Median	115.00	6.00	265.00
25 prcntil	105.00	5.00	107.00
75 prcntil	121.00	8.00	293.00
Geom. mean	114.42	6.11	201.09
Coeff. var	7.62	27.13	40.54

The statistical safety of the experimental data and the presence of variance in the data set were confirmed by the ANOVA Test (Alpha = 0.05), Table 2.

Table 2

ANOVA Test results

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	352516.8	2	176258.4	63.997	<0.001	3.219
Within Groups	115674	42	2754.14			
Total	468190.8	44				

Low variability was recorded in the series of values for the PH parameter (CV = 7.62), moderate variability within the MSN parameter (CV = 27.13) and high variability within the FNP parameter (CV = 40.54), Figure 2.

The data series presented normal distribution, with r = 0.980 (PH parameter), r = 0.975 (MSN parameter), r = 0.915 (FNP parameter).

No outlier values were recorded in the data series, according to Grubbs test (G), and Dixon Q test (Q), with statistical safety parameter values p>0.05, Table 3. The data series presented balanced data distribution, and no statistically significant data trends were recorded (p>0.05), according to Mann-Kendal trend test, Table 4.

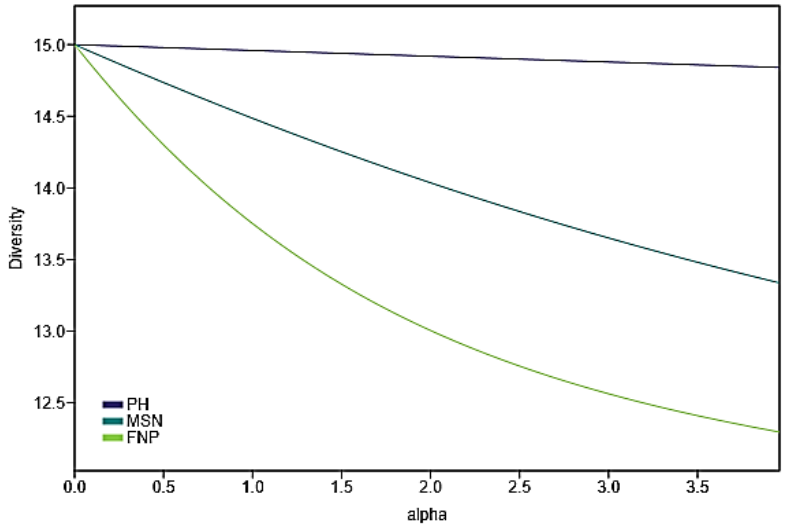


Figure 2. Graphical expression of the variability of the parameters studied in *Myrtus communis* specimens

Table 3

Outliers Test results

Test and parameters	PH	MSN	FNP
Grubbs test			
G	1.631	1.552	1.549
p(no outlier)	1.000	1.000	1.000
Dixon Q test			
Q (r22):	0.167	0.200	0.085
p(no outlier)	0.902	0.842	0.985

Table 4

Mann-Kendal trend test

Statistical parameter	PH	MSN	FNP
S	-3	-9	8
Z	-0.099	-0.403	0.347
p	0.921	0.687	0.729

Correlation analysis indicated positive correlation with strong intensity between PH and MSN (r = 0.899), and negative correlation with strong intensity between FPN and MSN (r = -0.876), and of moderate intensity between FPN and PH (r = -0.725).

Regression analysis was used to describe the interdependence relationship between plant parameters. The MSN parameter variation in relation to PH was

described by equation (1) under conditions of R^2 = 0.849, p<0.001. An increasing trend of MSN values in relation to PH was recorded, Figure 3.

$$MSN = -0.00526x^2 + 1.393x - 83.88 \quad (1)$$

where: MSN – main stems number; x – PH parameter (plant height, cm)

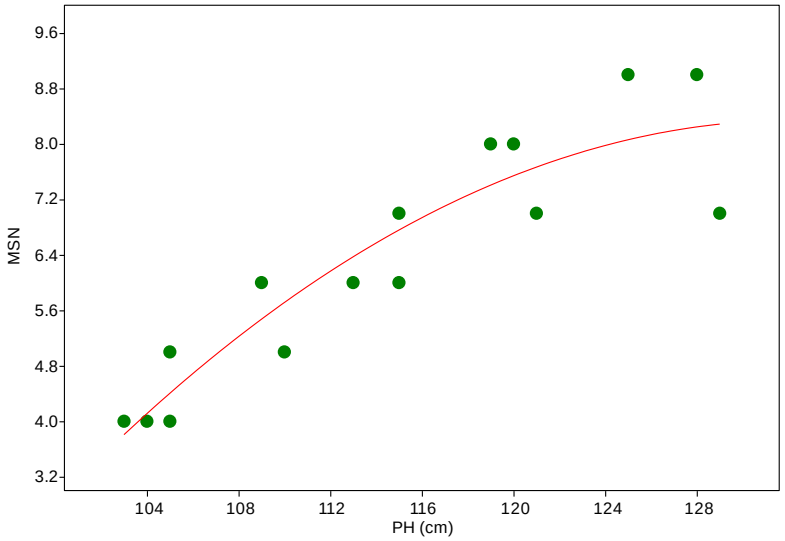


Figure 3. Graphical distribution of equation (1) and MSN values in relation to PH, *Mirtus communis* L. specimens

The FNP parameter variation in relation to PH was described by equation (2), under conditions of R^2 = 0.602, F = 9.061, p = 0.003. A decreasing trend in the number of fruits per plant was recorded, in relation to the height of the plants.

$$FNP = 0.3846x^2 - 96.39x + 6193 \quad (2)$$

where: FNP – fruit number on plants; x – PH parameter (plant height, cm)

Starting from equation (2), the value for x_{opt} was determined, according to equation (3), and the result was x_{opt} = 125.32 cm.

$$x_{opt} = -\frac{b}{2a} \quad (3)$$

where: a = 0.3846 ; b = -96.39 (in Eq. (2))

The FNP parameter variation in relation to MSN was described by equation (4), under conditions of R^2 = 0.778, F = 20.979, p<0.001. A decreasing trend in the

number of fruits per plant (FNP) was recorded, in relation to the number of main stems per plant (MSN).

$$\mathrm{FNP} = -3.399x^2 - 2.65x + 385.6 \quad (4)$$

where: FNP – fruit number on plants (y – axis); x – MSN parameter (main stem number); a = -3.339 ; b = -2.65 ; c = 385.6

Starting from equation (4), the value for x_{opt} was determined, according to equation (5).

$$x_{opt} = -\frac{\mathrm{b}}{2\,\mathrm{a}} = \frac{-2.65}{2\cdot(-3.339)} \quad (5)$$

Since the parabola has a negative coefficient for x^2 (a<0), the parabola is oriented with the opening downwards, having a maximum point at its peak. The optimal x value (x_{opt}) represents the x coordinate of the peak of the function, where the value of y reaches its absolute maximum of 386.125, figure 4. The optimal value of x (which determined the maximum point of the function) was $x_{\mathrm{opt}} \approx -0.3968$.

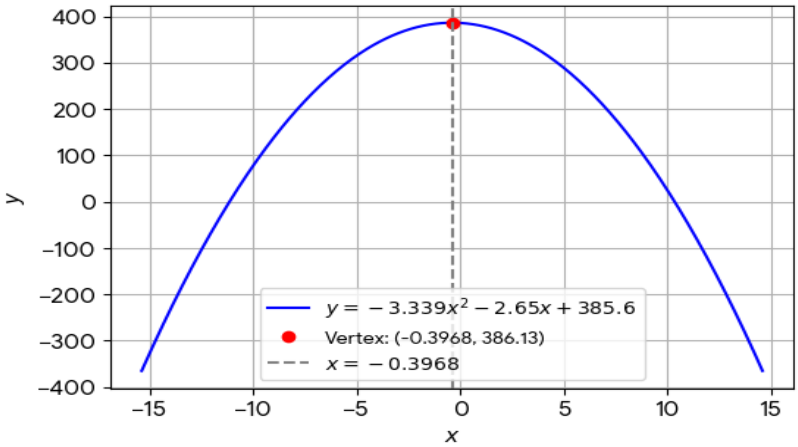


Figure 4. Graphical representation of the function and the x_{opt} and y_{max} values

Quadratic regression analysis was used to describe the variation of FPN in relation to PH and MSN, as direct and interaction effect. The result was equation (6), with $R^2 = 0.821$, p = 0.0035, with the graphical distribution in Figure 5.

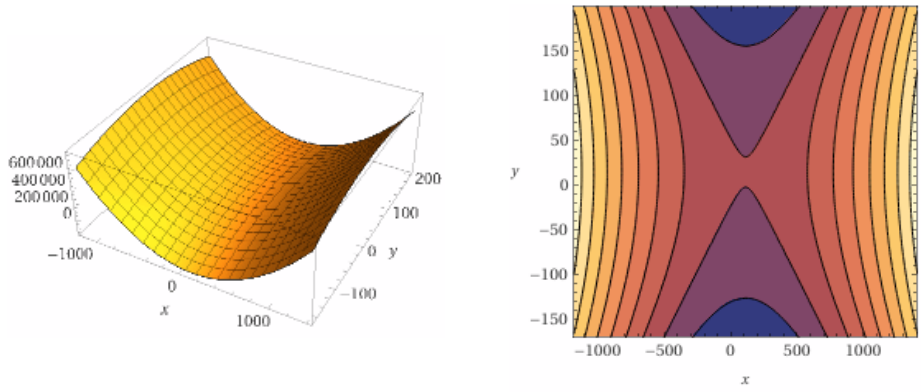
$$\mathrm{FNP} = \mathrm{a}\,x^2 + \mathrm{b}\,y^2 + \mathrm{c}\,x + \mathrm{d}\,y + \mathrm{e}\,xy + \mathrm{f} \quad (6)$$

where: FNP – fruit number on plants; x – PH parameter (plant height, cm); y – MSN parameter (main shoot number); a = 0.4567206; b = -5.1446348; c = -

98.4670479; d = 157.7480217; e = -1.1629414; f = 5557.0140801

Based on the values of the coefficients of equation (4) and the graphical distribution (Figure 5), the divergent contribution of the two parameters (PH, MSN) to the formation and variation of FNP values was observed.

A large amplitude of variation of FNP was recorded in relation to the PH parameter (x – axis) and a small amplitude of variation in relation to MSN.



(a) (b)

Figure 5. Graphical distribution of the FNP parameter in relation to PH (x = axis) and MSN (y – axis) in myrtle; (a) – 3D model; (b) – model in isoquant format

Also, based on the recorded values, it can be appreciated that the two parameters require a differentiated approach to control the number of fruits per plant. Myrtle leaves, fruits, seeds and essential oils represent important natural resources of phytonutrients and bioactive compounds, with importance for functional foods and human health (Giampieri et al., 2020). Following a domestication process, in several stages, three myrtle populations were analyzed in terms of biometric characters at the level of leaves, shoots and fruits (Medda and Mulas, 2021). The study authors recorded high variability in wild populations, and new variability as a result of hybridization, with utility in myrtle genetic improvement programs (Medda and Mulas, 2021). The results of this study contribute to the development of a database and information on the variability of some agronomic parameters and fruit yield in myrtle, and the possibility of growing myrtle in pots.

CONCLUSIONS

Myrtle plants, *Myrtus communis* L., grown in pots, aged 4 years, presented differentiated variability in agronomic parameters and number of fruits per plant. Plant height (PH) presented low variability (CV = 7.62) which showed the relatively uniform growth rate of the plants. Moderate variability was shown by the mean number of stems (MSN, CV = 27.13), which may indicate the differentiated branching capacity of the plants. The number of fruits per plant (FNP) showed high variability (CV = 40.54). Regression analysis showed the decreasing variation of the FNP parameter in relation to PH and in relation to MSN, as a direct relationship. Quadratic regression analysis described the variation of FNP in relation to PH and MSN, as a

direct and interaction effect. PH and MSN parameters showed divergent action in the formation and variation of the number of fruits per plant (FNP). The results are important for the management of myrtle cultivation in pot conditions, with the possibility of adjusting plant parameters in relation to fruit production.

ACKNOWLEDGEMENT

The authors wish to thank to University of Life Sciences "King Mihai I" from Timisoara to facilitate this study.

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