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QUALITY OF GOJI BERRY FRUIT GROWN IN MARACINENI

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Abstract
Goji fruits from the Lycium barbarum L. and L. chinense Mill. plants, belonging to the Solanaceae family, have a long history of being utilized as both food and medicine in Asian nations for centuries and are presently enjoyed worldwide. Wolfberry fruit, also known as Lycium barbarum L.. The quality of herbal remedies is essential for ensuring their safe consumption and has been demonstrated to be influenced by supply chains. Lycium barbarum has a history of use in traditional Chinese medicine for nourishing the liver and kidneys, as well as improving vision. Its fruits are either dried or freshly squeezed to extract juice, which is then concentrated for beverages. However, the quality and functional component content of these fruits vary noticeably depending on the geographic region in which they are grown.
In this study, we analyzed the plant productivity and fruit quality of various goji fruit samples obtained from 22 genotypes in Mărăcineni, Argeş.

Keywords: fruit production, Lycium barbarum, quality berries, wolfberry

1. INTRODUCTION

Recent studies indicate that certain natural foods and medicinal plants may play a role in preventing (Dahech et al., 2013; Hasnat et al., 2013) or impeding the onset of various diseases (Oliveira et al., 2014; Vlase et al., 2012). There is a growing interest in developing natural nutritional antioxidants due to their well-documented benefits to human health (Pratt et al., 1992; Li et al., 2007; Serafini et al., 2002; Di Matteo et al., 2002), as opposed to synthetic antioxidants which have been linked to endocrine disruption and potential carcinogenic effects (Dahech et al., 2013; Pop et al., 2013; Vlase et al., 2013; Popa et al., 2014). Polyphenols, recognized as common antioxidant compounds in human diets (Huang et al., 1992; Hasnat et al., 2013), exhibit diverse biological properties, underscoring the importance of understanding their presence and types in medicinal plants and natural foods (Inbaraj et al.,2010). The genus *Lycium* L. (*Solanaceae*) plants have gained significance recently, attributed to their traditional use in Chinese herbal medicine. They are widely recognized as functional foods with various beneficial effects (Li et al., 2007; Qian et al., 2004). The *Lycium* genus consists of around 70 species found in different regions spanning from temperate to subtropical areas across Eurasia, North America, South America, southern Africa, and Australia Fukuda et al., 2001; Amagase et al., 2011). *Lycium barbarum*, also known as wolfberry, is a deciduous shrub belonging to the *Solanaceae* family. It is native to China, Tibet, and various regions in Asia. The fruits of Lycium barbarum are small, measuring 1–2 cm in length, and are

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characterized by their bright orange-red, ellipsoid shape (Wang et al., 2015). In Romania, the *Lycium* genus is represented by two species, *Lycium barbarum* L. and *Lycium chinense* Mill. (Ciocârlan et al., 2009), identified as either cultivated or sub-spontaneous species.
In recent years, *L. barbarum* (Chinese wolfberry, Barbary wolfberry, or Chinese boxthorn) has gained popularity as a superfood known for its beneficial nutritional and antioxidant properties (Amagase et al., 2009). The use of its fruits as a functional food dates back to 2,800 B.C. in Chinese traditional medicine, while the leaves are also consumed in tea infusions or as spices (Jin et al., 2013; Dong et al., 2009). The most extensively studied components of L. barbarum fruit are the water-soluble polysaccharides, which are estimated to make up 5%–8% of the dried fruits (Amagase et al., 2009). The carotenoids group, mainly zeaxanthin and its esters (Inbaraj et al., 2008), constitute a small percentage of 0.03%–0.5% in dried fruit. Research in China has primarily focused on polysaccharides (Cheng et al., 2011; Cui et al., 2011), while studies outside China have explored antioxidants, alkaloids, glycopeptides, glycoprotein, and tocopherols. Other compounds found in L. barbarum fruit include flavonoids, phenolic acids, sterols, and betaine (Wang et al., 2010; Wu et al., 2015). Recent studies highlight the biological activities of *L. barbarum* fruit extracts and polysaccharides, such as effects on aging, neuroprotection, anti-fatigue, hypoglycemic properties, metabolism enhancement, glaucoma, anti-cancer effects, immunomodulation, and antioxidant properties.
The berry is elongated or oval-shaped, measuring between 6-20 mm in length and 3-10 mm in diameter. It is typically orange or dark red in color, featuring a small stylar scar at the top and a wrinkled skin. The flesh of the berry is soft and fleshy, offering a combination of bitter and sweet flavors. This berry is enjoyed fresh, juiced, or as an ingredient in tea or wine. Additionally, it is utilized in the production of tinctures, powders, and tablets. In East Asia, it serves both as a food source and a medicinal plant. In China, it has been commonly referred to as Goji since the early 2000s (Gao et al.,). The aim of this paper was to analyse fruit quality of various goji hybrids and to available to grow in Mărăcineni, Argeș, Romania.

2. MATERIALS AND METHODS

The study was conducted during the period 2013-2014 at the experimental field at Small Fruit Department of Research Institute for Fruit Growing Pitești, Romania.
The research was conducted from 2022 to 2023 at the Research Institute for Fruit Growing (RIFG) in Pitesti, Romania (44°54’12” N latitude, and 24°52’18” E longitude, 284 m altitude) in an open experimental field at Small Fruit Department.
Twenty-one genotypes selected in 2018 were evaluated along with one cultivar ('Kronstadt') as a control during the period 2022-2023 in a randomized block design with three replicate plots (10 plants per genotype per replicate).

Fruit quality parameters

The recorded measurements were taken during the ideal fruit harvesting season from a sample of 50 fruits. All measurements and analyses were carried out with 3 replications. ***Fruit production*** (g/plant) was calculated by weighing the fruits on each plant at every harvest and summing the yield. The average ***fruit weight*** was determined by using the HL-400 digital balance to weigh each fruit. The ***shape index*** of the fruit was calculated as the ratio of these two dimensions (Grygorieva

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et al., 2021). ***The total soluble solids*** content (TSS) was measured using a digital refractometer Haana Instruments 96801 and values were recorded in °Brix. Additionally, the length and diameter of the fruit were determined by measuring the fruit using a digital caliper. The ***shape index*** of the fruit was calculated as the ratio of these two dimensions (Grygorieva et al., 2021). The ***pH*** of the fruits was determined using the digital pH meter IQ Scientific, on average samples analyzed at each harvest. and the berry ***firmness*** was assessed non-destructively using a Bareiss HPE II Fff penetrometer for each sample.

Statistical Analysis

The analyses were conducted with three repetitions, and the data were presented as mean ± standard deviation (SD). Excel 2021 (XLSTAT) was utilized for statistical analysis of the data. One-way analysis of variance (ANOVA), two-way ANOVA and Duncan's multiple range tests were carried out.

3. RESULTS AND DISCUSSIONS

The main biometric characteristics of the goji fruit refer to its yield, size, shape, and pulp texture, expressed through average weight, size index, and firmness. Significant differences have been observed between genotypes concerning the biometric indicators of the fruits (production, average weight, size, firmness).

Significant differences in berry fruit yield were observed among different genotypes, ranging from 64 g/plant for Sl-12 to 160 g/plant for the 'Kronstadt' cv. (fig. 1)

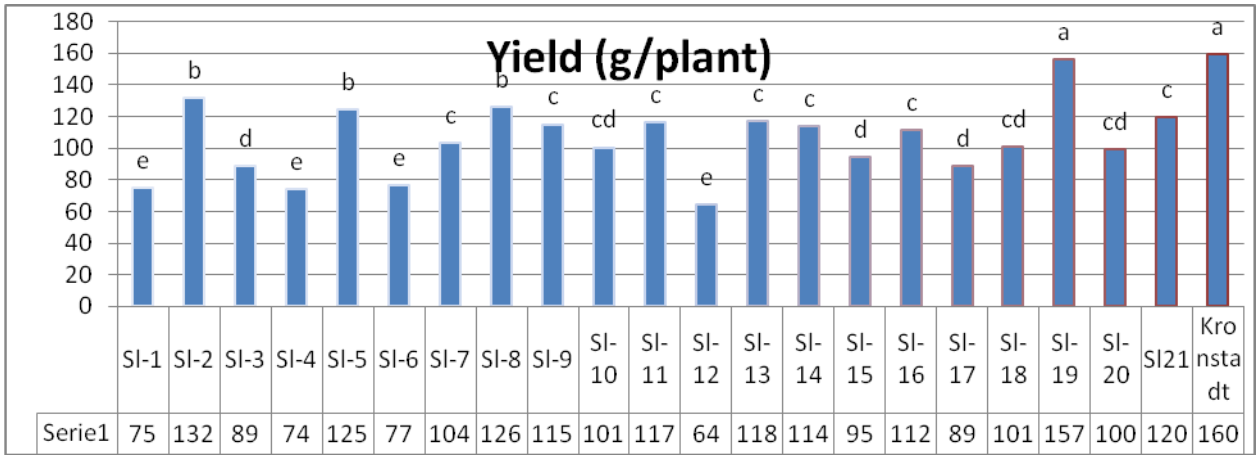

Figure 1. Yield (g) of different genotypes of goji berry fruit (average 2022-2023)

The average weight of the fruit is a genetically determined characteristic, influenced by technical and cultural conditions, showing different values in the three years of study. In our study, significant differences were recorded between genotypes. The higher fruit weight was recorded by the Sl-16, Sl-17, Sl-18, Sl-19, Sl-20, Sl-21 and 'Kronstadt' cv. The lowest fruit weight was recorded by the Sl-2, Sl -4, Sl - 7, with a value of 0.4 g (fig. 2).

The size of the blueberry fruit is an index that indicates the precision of the harvesting time. It is necessary to consider eco-geoclimatic factors and plant yield. The mean size index oscillated between 1.6 for Sl-11 and 1.9 for Sl-2, Sl-5, Sl-6, and Sl-12 (fig. 3).

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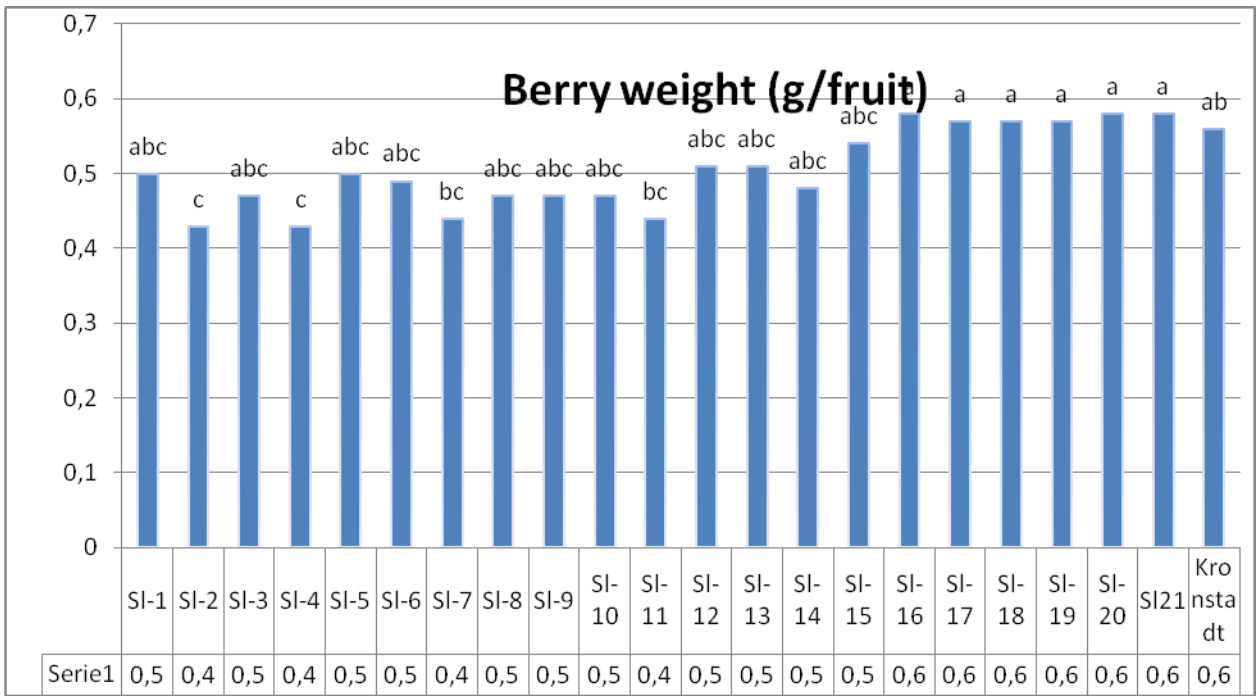

Figure 2. Berry weight (g) of different genotypes of goji fruit (average 2022-2023)

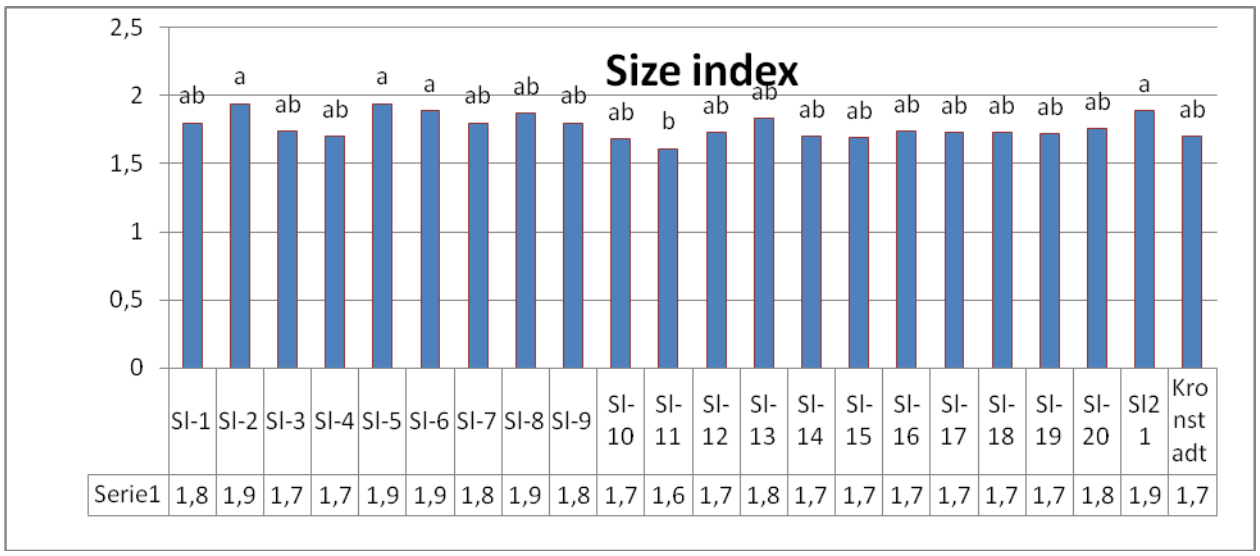

Figure 3. Size index of different genotypes of goji berry fruit (average 2022-2023)

The Brix value indicates the the total dissolved solids in fruits, influencing the sensory quality significantly. The soluble solids content reached the upper limit of 17 °Brix at Sl-1, and the lower limit of 23 °Brix at Sl-2 (fig. 4).

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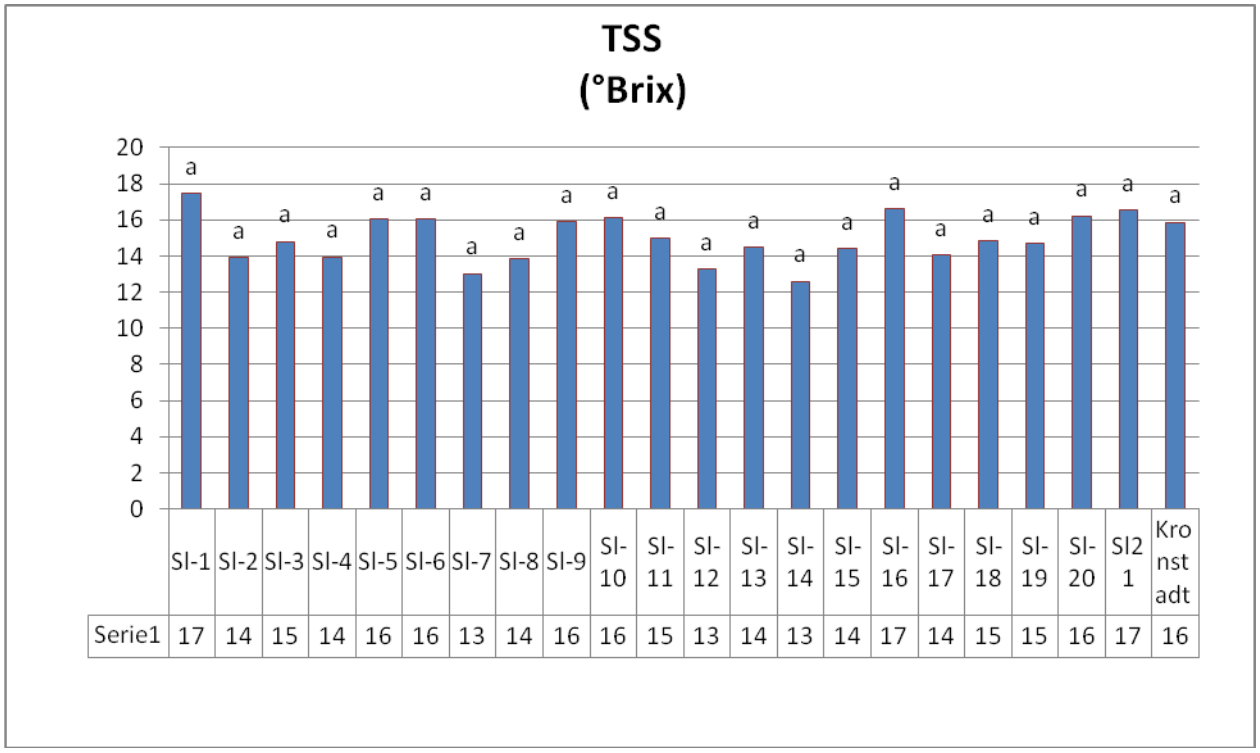

Figure 4. Total soluble solids (°Brix) of different genotypes of goji berry fruit (average 2022-2023)

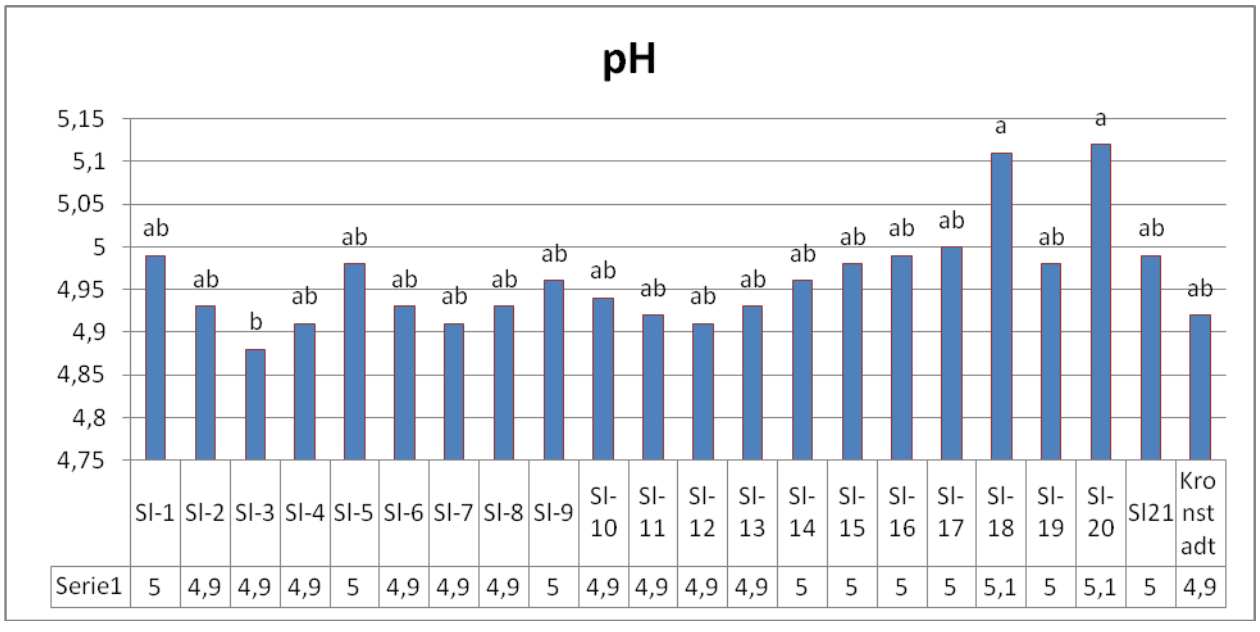

Figure 5. pH of different genotypes of goji berry fruit (average 2022-2023)

The pH levels of goji fruit varied between 5.1 for Sl-18 and Sl-20, and 5- 4.9 for several other selections (fig. 5).

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Fruit firmness is a main parameter for fresh fruit, influencing the quality and post-harvest storage potential. In horticultural studies, fruit firmness is also referred to as a textural or mechanical quality that can indicate differences in fruit ripeness or horticultural product quality (Musacchi et al., 2018). In our research, fruit firmness ranged from 23 N for Sl-1 and 27 N for Sl-1 (fig. 6).

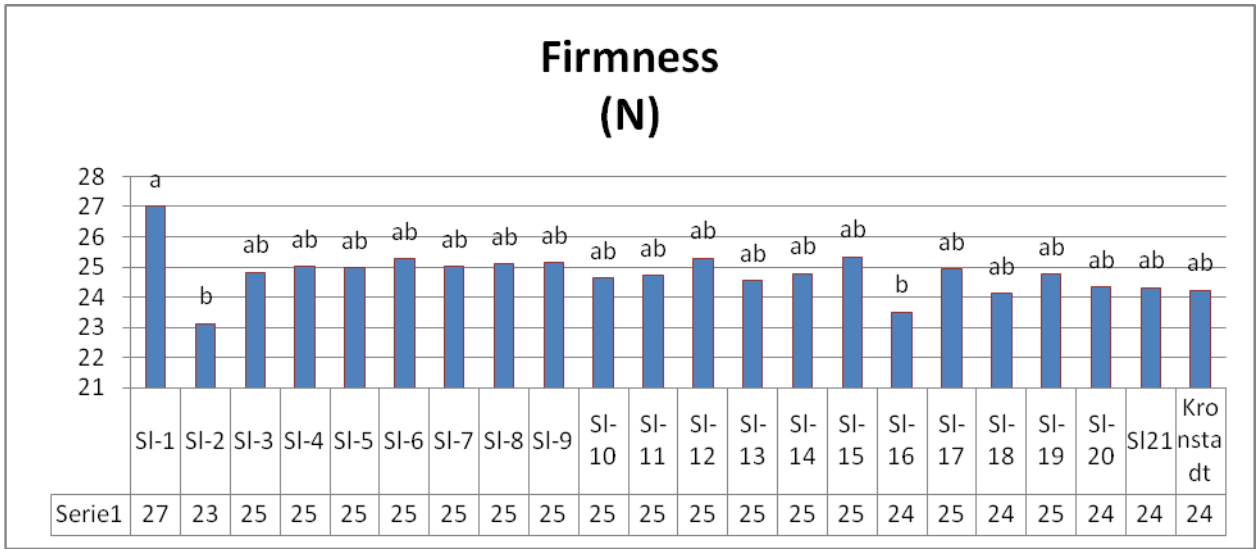

Figure 6. Firmness (N) of different genotypes of goji berry fruit (average 2022-2023)

4. CONCLUSIONS

Berry weight is greatly influenced by different genotypes, agro-environmental factors, and weather conditions. Throughout the three-year study, all genotypes demonstrated an increase in berry weight.

Among all the cultivars examined, 'Kronstadt' demonstrated the highest yield values. Sl-19 exhibited the highest values for yield, weight per plant, size index, and fruit firmness.

Both the 'Kronstadt' cultivar and the selections mentioned are valuable for breeding programs because they have the potential to provide genetic variability.

5. ACKNOWLEDGEMENTS

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