INFLUENCE OF PHOTOSELECTIVE NETTING ON GROWTH OF CHERRY LAUREL (*Prunus laurocerasus* L.) SAPLINGS

Damir Drvodelić, Marko Vuković**, Tomislav Jemrić***

** Faculty of Forestry and Wood Technology, University of Zagreb, Zagreb, Croatia*

*** Faculty of Agriculture, University of Zagreb, Zagreb, Croatia*

**ddrvodelic@inet.hr*

Abstract

Cherry laurel (*Prunus laurocerasus* L.) is an ornamental shrub used mainly for hedges. It is tolerant to pruning and air pollution, making this species ideal for urban horticulture. Cherry laurel is propagated commercially by stem cuttings, which are rooted in the period from June to April. Nets have long been used in horticulture against hail, wind and excessive sunlight. Recently, a new technology of photoselective nets has appeared. They are not only used for plant protection, but also stimulate the desired physiological plant responses by spectral manipulation and improve light utilization by scattering. The main objective of this study was to investigate the possible effects of different colored photoselective nets on the vegetative characteristics of cherry laurel. The study was conducted in 2019 and 2020 in the nursery garden of the Faculty of Forestry and Wood Technology, Zagreb, Croatia. Rooted cherry laurel cuttings from a heated greenhouse were transplanted into outdoor beds on June 28, 2019, at 10 x 20 cm spacing in rows. Three photoselective nets were used: a white, yellow, and red net (AGRITECH S. r. l., Eboli, Italy) and a standard green shade net as control. In each treatment, 30 rooted cuttings ere transplanted, for a total of 120 cuttings. The following morphological variables of the saplings were measured: height, root collar diameter, root collar cross-sectional area (TCSA), slenderness coefficient, number of first-stage branches in the lower third of the plant, total number of first-stage branches, total length of first-stage branches in the lower third of the plant, total length of all first-stage branches, and average length of first-stage branches in the middle part of the plant. The measurement was performed on June 9, 2021. Data were statistically analyzed using SAS Ver. 9.4 statistical software (SAS Institute, NC) using ANOVA and Tukey's HSD test ($P \leq 0.05$). The results show that there are no statistically significant differences vegetative traits of cherry laurel saplings grown under different types of nets. Therefore, green shade netting can be used for cherry laurel saplings in nurseries. Further studies are needed to test this technology under other agroecological conditions. Yellow nets show promising effects on the growth potential of cherry laurel saplings as they induce more branching.

Key words: *Prunus laurocerasus L., quality, vegetative growth, light modification*

Introduction

Laurel cherry (*Prunus laurocerasus* L.) is the bushy species most commonly used in horticulture for planting hedges. The Latin name of the genus *Prunus* was derived from the Greek word proumnon (plum tree) in 1737 by Carl Linnaeus, the father of taxonomy. It received the name laurocerasus because of the similarity of the leaf to laurel and the fruit to cherry (Bučar, 2018).

Because of its easy cultivation and decorative leaves, it is often used in horticulture. It is a fast-growing, heliophiilic species that tolerates well shady locations, drought, pruning and air pollution, which makes this species ideal for urban horticulture. In Croatia, it is a very popular species in nurseries and garden centres for planting hedges for many years (and still today), as its price is low compared to the benefits it offers. Cherry laurel is propagated commercially by stem cuttings that are rooted between June and April. The use of plastic nets in the nursery production of many ornamental species is considered standard. Plastic nets consists of plastic threads (usually high-density polyethylene) that are woven or knitted to form a regular porous geometric structure through which fluids (gases and liquids) can pass (Castellano et al., 2008). In this way, the mesh provides physical protection of plants from environmental hazards such as excessive sunlight, hail, wind, frost, and/or flying pests (insects, birds, bats) (Shahak, 2014). Photoselective netting is an emerging technology by which the netting is used to modify the quality of the transmitted light, in addition to its basic protective (Basile et al., 2012). It was originally developed for ornamental species to create a "smart shade" that outperforms the traditionally used black netting (Oren-Shamir et al., 2001). Because the nets consist of holes in addition to translucent, photoselective plastic filaments, they create a mixture of natural, unmodified light passing through the holes and diffuse, spectrally modified light emitted by the photoselective filaments (Shahak, 2008). The relative amount of modified versus unmodified light, as well as the shading factor, is determined by the knit design/density and the chromatic and light-dispersive additives (Shahak, 2008). Many studies have reported that the application of photoselective netting can differentially affect the vegetative characteristics of ornamental (Oren-Shamir et al., 2001) and fruit species (Bastias, 2011; Basile et al., 2014; Aoun and Manja, 2020; Brar et al., 2020; Jemrić et al., 2021; Vuković et al., 2022). Therefore, the objective of this study was to test the ability of different photoselective nets to influence the vegetative characteristics of cherry laurel in a way that increases ornamental value and, consequently, the profitability of cultivation.

Materials and methods

The study was conducted in 2019 and 2020 in the nursery of the Faculty of Forestry and Wood Technology in Zagreb, Croatia. Rooted cherry laurel cuttings from a heated greenhouse were planted 10 x 20 cm apart in in outdoor beds on June 28, 2019. Three photoselective nets were used: a white, yellow, and red net (with a mesh size of 2.4 × 4.8 mm) and a standard green shade net (with a mesh size of 1.0 x 2.0 mm) as control. In each treatment, 30 rooted cuttings were transplanted, for a total of 120 cuttings.

The following morphological variables of cherry laurel were measured: height (cm), root collar diameter (mm), root collar cross-sectional area (TCSA), slenderness coefficient, number of first-stage branches in the lower third of the plant, total number of first-stage branches, total length of first-stage branches in the lower third of the plant (cm), total length of all first-stage branches (cm) and average length of first-stage branches in the middle part of the plant (cm). The measurements were performed on June 9, 2021. Root collar diameter was determined by cross measurement using Prowin HMTY0006 digital scroll scale.

Data were statistically analyzed with SAS Ver. 9.4 statistical software (SAS Institute, NC) using ANOVA and Tukey's HSD test ($P \leq 0.05$).

Results and discussion

Tables 1 and 2 show that the application of photoselective netting had no significant effect on the all studied vegetative characteristics of cherry laurel. However, despite high standard deviations that greatly affect their significance, certain trends are evident. Cherry laurel saplings grown under red net had the highest average plant height and total length of all first-stage branches. Saplings grown under red and yellow nets had the highest average total length of first-stage branches in the lower third of the plant and the highest average length of first-stage branches in the middle part of the plant. On the other hand, saplings grown under green net had the lowest average TCSA, total length of first-stage branches in the lower third of the plant and total length of all first-stage branches. Saplings grown under a yellow net had the lowest average plant height but the highest average root collar diameter and TCSA. According to the European Nurserystock Association standard, cherry laurel saplings must have a minimum container volume of 3 L, a minimum height above substrate of 40 cm, a branched shape, and at least three branches in the lower third. Only plants grown under the yellow net achieved the desired number of 3 or more branches, but the difference was not significant compared to other nets.

These results obtained under the red net are probably due to the action of the shadow avoidance mechanism. The results of the shade avoidance mechanism include increased shoot growth and increased apical dominance (Smith and Whitelam, 1997), which was the case of cherry laurel saplings grown under red net. According to Casal (2012), shade avoidance responses are the changes in plant body form and function that occur in response to light signals provided by neighbouring vegetation and serve to reduce the degree of current or future shading. These signals include, but are not limited to, reductions in the ratio of red to far red perceived by phytochromes (Casal, 2012). The reduction of the ratio between red and far-red under the red net was found in other studies (Shahak et al., 2004a, 2004b; Basile et al., 2012).

Conclusions

Since no significant differences were found in this study, it can be concluded that green shade netting can still be used for cherry laurel saplings in nurseries. However, it should be noted that further studies are needed to test this technology under other agroecological conditions and over several years in order to draw a definitive conclusion. The yellow nets show a promising effect on the quality of cherry laurel saplings, as they promote branching.

Table 1. Effect of photoselective nets on height, root collar diameter, root collar cross-sectional area (TCSA), slenderness coefficient of cherry laurel

Treatment	Height (cm)	Root collar diameter (mm)	TCSA (mm^2)	Slenderness coefficient
Green net	63.93 ± 26.04a	13.56 ± 3.68a	154.58 ± 78.33a	47.53 ± 14.34a
White net	63.46 ± 22.31a	14.43 ± 5.33a	185.02 ± 149.5a	39.43 ± 10.16a
Red net	68.89 ± 26.65a	13.78 ± 4.01a	161.23 ± 90.61a	45.14 ± 15.03a
Yellow net	59.39 ± 24.7a	14.82 ± 5.15a	192.25 ± 136.79a	42.89 ± 7.82a

[1]means followed by the same letter with the same year are not significant according to Tukey's HSD test at P ≤ 0.05 significance level

Table 2. Effect of photoselective nets on number of first-stage branches in the lower third of the plant (NFSB-LT), total number of first-stage branches (NFSB-T), total length of first-stage branches in the lower third of the plant (LFSB-LT), total length of all first-stage branches (LFSB-T), and average length of first-stage branches in the middle part of the plant (ALFSB-MP)

Treatmet	NFSB-LT	NFSB-T	LFSB-LT (cm)	LFSB-T (cm)	ALFSB-MP (cm)
Green net	2.52 ± 1.90a	4.59 ± 3.02a	28,97 ± 29.74a	55.82 ± 47.50a	24.44 ± 24.74a
White net	2.68 ± 2.18a	4.68 ± 4.19a	34.25 ± 37.64a	64.04 ± 80.89a	25.54 ± 22.89a
Red net	2.71 ± 2.14a	4.93 ± 4.43a	35.61 ± 45.47a	71.68 ± 94.04a	27.22 ± 29.61a
Yellow net	3.07 ± 2.24a	4.82 ± 4.17a	35.50 ± 29.86a	67.27 ± 70.93a	27.68 ± 22.84a

[1]means followed by the same letter with the same year are not significant according to Tukey's HSD test at P ≤0.05 significance level

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